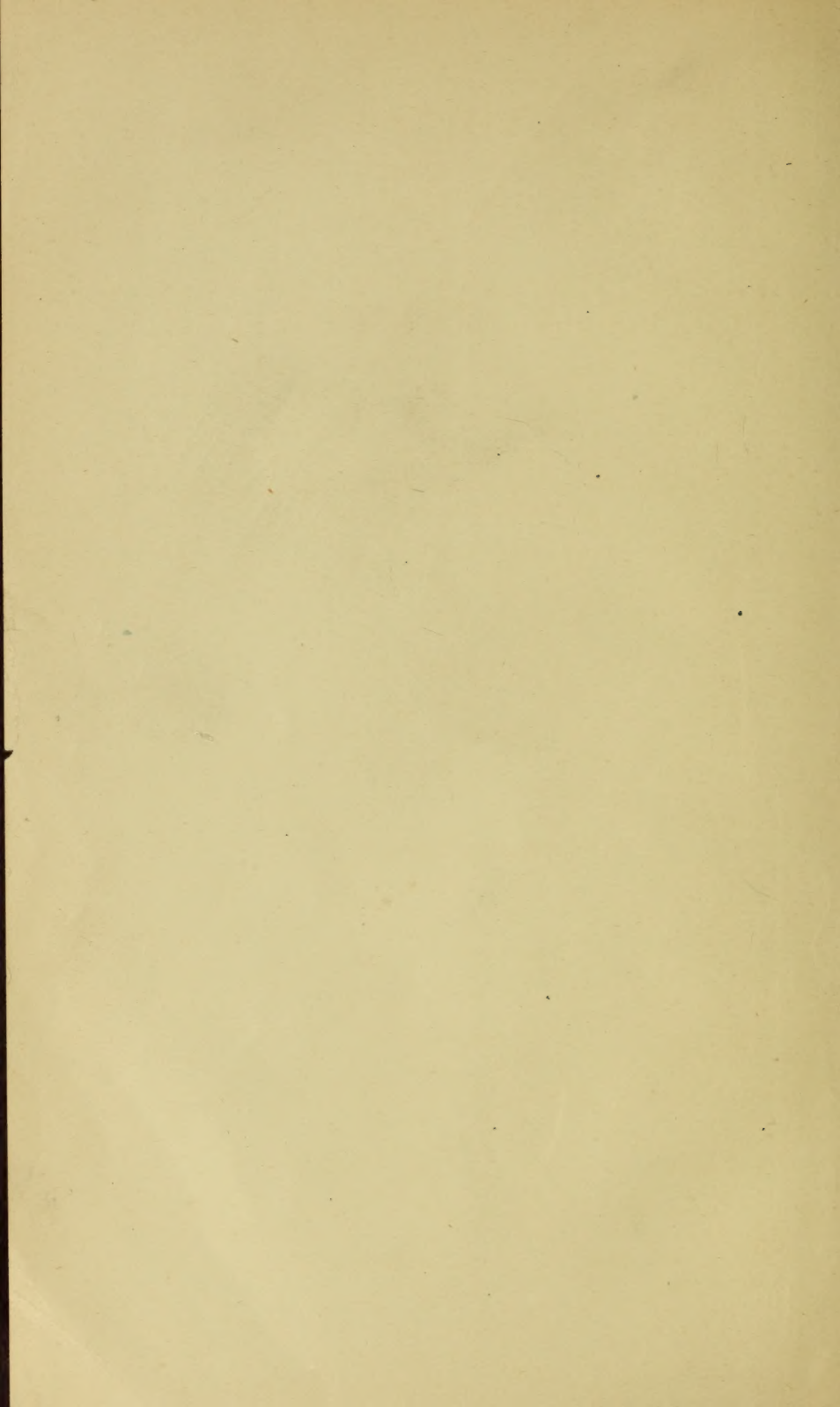


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THE GRASSES OF MAINE.

Orono, May, 1885.



With the compliments of the author.

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THE

GRASSES OF MAINE.

Designed for the use of the students of the Maine State College, and
the farmers of the State.

C. H. FERNALD, A. M.

Orono, May, 1885.

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Prepared for the use of the students of the Maine Agricultural College
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C. H. FERNALD, A. M.

Orange, N. H.

1888.

ALBANY:
PUBLISHED BY THE STATE
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THE GRASSES OF MAINE.

By PROF. C. H. FERNALD, MAINE STATE COLLEGE, ORONO.

INTRODUCTION.

The grass family is, without doubt, of far greater importance to mankind than all the other families of plants combined; for, including as it does all the cereals, as wheat, corn, oats, rye, barley, rice, etc., as well as sugar-cane, sorghum, bamboo, and the greater part of the forage plants which serve as food for grazing animals, we may well place this family far in advance of all others from an economic point of view.

When we remember that all our bread-stuffs come directly from this family, and that our meat comes from animals which feed directly or indirectly on the grasses, we can appreciate the profound utterance of the inspired writer when he says, "All flesh is grass."

If all the members of the grass family were swept from the surface of the earth, never to reappear, we can scarcely foretell what fatal consequences would follow. It is very doubtful if man and his domesticated animals could hold their own in the struggle for existence if compelled to seek their subsistence entirely from other plants.

The grasses are the most universally diffused over the globe of any of the flowering plants, for there is no part of the world free from snow, even for a short period of time, where they do not occur, and in nearly all they form a leading feature of the landscape. It has been estimated that there are not far from six thousand species of grasses, of which nearly ninety are already known to be indigenous or to have been introduced into Maine. Omitting the cereals, there are still over eighty species of the grass family already discovered growing wild or in cultivation in this State. Probably not

more than five or six of these are known by the mass of our farmers. The clovers are not included here, as they do not belong to the grasses, but to the pulse family (*Leguminosæ*).

According to the Census report for 1880, there were 1,107,788 tons of hay cut in the State of Maine in the year 1879. If we assume that the average value of that hay was ten dollars a ton, we have \$11,077,880 as the value of the hay crop for that year. It would be difficult to determine what proportion of the above quantity of hay was clover, but omitting all reference to the value of the grass in the pastures, which will, without doubt, far more than offset all the clover in the above-named amount of hay, we still have over eleven million dollars for the value of the true grasses which were grown in the State of Maine and cut for hay in the year 1879, and this sum is greater than the amount of the value of all the wheat, corn, rye, oats, barley, buckwheat, potatoes, peas, beans, orchard products, market-garden products and forest products of the entire State for the same year. It may well be claimed that grass is the most important of all our crops, and really forms the foundation of agriculture in the State.

We are informed that Rye-grass (*Lolium perenne*, L.) was first cultivated in England in 1677, but none of the other true grasses for nearly a century later, though the clovers had been cultivated long previous to that time. In 1759, some of the more progressive farmers commenced sowing the seeds shaken out of the best meadow grasses, along with the clovers, and in 1761-64 Timothy (*Phleum pratense*, L.) and Orchard grass (*Dactylis glomerata*, L.) were introduced from this country, and at the present time quite a long list of grasses is cultivated in Europe, and by a few in this country. By far the greater number of our farmers, at the present time, confine their culture to Timothy, Red-Top, Red and Alsike clover, while a few sow Orchard grass, Hungarian grass, and possibly a few others.

A great mistake is often made in sowing too few kinds of grasses, and as a result the plants are so far from each other that ample room is left for undesirable grasses and weeds to creep in. Another mistake is to sow a mixture of seeds of grasses which do not come into blossom at the same time, and it is, therefore, impossible to cut them at a time when all are in the best condition for hay. Many farmers cover their grass seed too deeply. Very careful experiments have been made, which showed that when the seeds of Timothy, Orchard

grass and clover were covered to the depth of from two inches to two and one-half inches, none of the plants came up, and when covered to the depth of one inch, only about half came up, but the greatest number came up when the seeds were covered one-fourth of an inch or less; yet how many farmers sow their seed along with the grain and go over it two or three times with a common tooth harrow! No wonder they are not able to secure a good catch. It is not an easy matter at the present time to secure pure seed, that which is free from the seeds of white-weed, buttercups, cone flowers, and a host of others too common in all our fields. We are not always sure that the seed offered for sale may not have been kept so long as to have lost its vitality. The seeds of most of the grasses are of little value if more than two years old.

It is more than probable that many of our Maine grasses not now in cultivation would prove to be as valuable, or more so, than some now made use of, and that from these wild grasses species might be selected, which would be adapted to the various conditions existing in our fields and pastures, and which would yield far better results than are now obtained. When a farmer observes an unknown grass growing luxuriantly in any part of his field, he should endeavor to find out what that grass is, what is known about it, whether it is of value as a forage, and if it proves to be valuable he should save the seed—unless he can find it for sale—and cultivate it in that part of his field and others of a similar condition. It may sometimes be necessary to make a critical study of a grass to find out what it is and what may be known about it, and to aid in this work was the design of the writer in preparing this paper. A common lens, costing from seventy-five cents to a dollar, will prove of great assistance in the determination of the species.

STRUCTURE OF THE GRASSES.

A grass is composed of *root, stem, leaves and flowers*. The roots usually consist of small fibers, which in some species are exceedingly flexible, often extending to great distances in search of food, and branching into innumerable rootlets, the ends of which are the newest parts and composed of those cells which absorb the food for the plant. Besides the roots, many grasses, as witch grass, have *underground stems* (Rhizoma or root-stock), by means of which they rapidly and extensively propagate themselves. These under-

ground stems, unlike the true roots, have joints with scales representing the leaves, and from these joints rootlets are put out and new plants developed.

The stems of the grasses consist of *nodes* and *internodes*, or joints and the spaces between them. The joints are solid, and a cross section is circular in all our species with the exception of wire grass (*Poa compressa*, L., plate XVII). In this species the node or joint is compressed or flattened so that it cannot be rolled between the thumb and finger. The internodes, or spaces between the joints, are hollow in all the Maine grasses except corn and a grass found growing occasionally on our sea beaches and known as Beach grass (*Ammophila arundinacea*, Host.).

The arrangement of the leaves on the stem is of great importance in distinguishing the grasses from some of the related families of plants. In the grasses there is one leaf from each node or joint, the first from the lowest joint of the stem; the second from the next joint above, but on the opposite side of the stem; the third leaf from the third joint and on the opposite side from the last leaf, but directly over the first, and so on. The leaf consists of the sheath (*petiole*), the *ligule* and the blade (*lamina*). The sheath is the part surrounding the stem, and which, starting up from a node, extends nearly up to the next node, where it joins the long, narrow blade of the leaf. Although the sheath surrounds the stem, the edges merely touch or overlap, but are never grown together except in exceedingly rare cases. At the place where the sheath ends and the blade begins, there is a thin and more or less transparent membrane called the *ligule*. This is an upward continuation of the sheath above its junction with the blade of the leaf, and, as it varies in size and form, it is much used in the classification of the grasses. The blade is long and narrow, with a stout vein through the middle called the midrib, and smaller veins on each side parallel to the midrib.

The flowers of the grasses are variously arranged in *panicles* (for an illustration of a panicle see plate IX or plate XIX) or *spikes* (see plates I and II), each individual flower consisting of what are called the essential organs and the protecting organs, which simply enclose and protect the essential organs. These last consist of *stamens* and a *pistil*, which may both occur in the same flower, when it is said to be *perfect*, or one flower may contain only the stamens and another only the pistil. Flowers in the former case are said to be *staminate* or *sterile*, in the latter, *pistillate* or *fertile*. When the

staminate and pistillate flowers are on the same plant, it is said to be *monœcious*, but when they are on separate plants they are said to be *diœcious*.

The pistil consists of three parts, an *ovary*, a *style* and a *stigma*. The ovary contains the *ovule* or the rudimentary seed, and from the top of the ovary two styles extend upwards with feathery stigmas at their tops. The flowers are usually furnished with two or three minute scales (*squamulæ*) near the base of the pistil. The stamens consist of a long, slim, thread-like body called the *filament*, which arises near the base of the ovary, and to its outer end is attached the *anther*, a sort of case deeply notched at each end, and within which is a cavity on each side, in which the *pollen*, or fertilizing powder, is developed. There are usually three stamens in each flower, though sometimes only one or two. When the pollen is mature, the sides of the anther split open lengthwise, and the pollen is scattered by the wind, and falling on the feathery stigma of the pistil, fertilizes the ovule within, so that it develops into a seed capable, under favoring circumstances, of producing another and similar plant. These pollen grains are composed of an outer, somewhat hard and roughened covering, within which is a separate but delicate sack-like lining filled with a dense fluid often containing a large number of minute granules. When a grain of pollen falls on the stigma, it absorbs moisture, bursts the outer covering, and the inner sack extends down through the tissues of the style in the form of a long fine tube, still holding the granular contents of the original pollen grain. This tube penetrates the ovary, and coming in contact with the ovule, fertilizes it, probably by the contents of the tube passing through and mingling with those of the ovule.

The protecting organs are somewhat chaffy and scale-like in appearance, and consist of an outer pair, one on each side, called *glumes*, *outer glumes* or *lower glumes*, within which are one or more *flowers*, each of which is enclosed within another pair of protecting organs, the lower or outer one of which is called the *flowering glume*, and the one on the opposite side, the edges of which are often enclosed by the flowering glume, is called the *palea* or *palet*. See plate XXXV, *a*, which represents the pair of glumes widely separated at the top, and the flower represented as separated and raised above the glumes, showing the large flowering glume on the right, the smaller palea on the left, and three stamens, two on the right within the flowering glume, and one on the left above the

palea. In the middle, between the flowering glume and palea, is seen the top of the pistil, from which arises a pair of styles with feathery stigmas. At the base of the flower two hairy or feather-like bodies are seen, which are considered rudimentary or undeveloped flowers.

Sometimes one or more of the protecting organs are wanting, and there are frequently longer or shorter rough, bristle-like bodies called *awns*, arising from the back or tip of one or more of these protecting organs, as shown in plate XXX, *b*, and plate XXXVIII. The glumes with their included flowers form what is called a *spikelet*, which may comprise a single flower (plate X, *a*.) or several, as in plate XIX, where the enlarged spikelet shows a pair of glumes at the bottom, within and above which are seven flowers, showing only the flowering glume of each and five stamens emerging from the flowers. The axis, or continuation of the branch along which the flowers of the spikelet are arranged alternately, is called the *rachis* or *rhachis*.

The only plants with which the grasses are liable to be confounded are the sedges (*Cyperaceæ*) and the rushes (*Juncaceæ*). They may be readily distinguished from the sedges by the arrangement of the leaves. In the grasses, as already explained, they arise one from each joint, but from opposite sides of the stem. In the sedges there is also one leaf from each joint, but they are separated by one-third of the distance around the stem, so that the fourth leaf comes direct over the first, instead of the third, as in the grasses. The sheaths of the leaves of the grasses are split on the side opposite the blade, while those of the sedges are entirely close, forming a complete cylinder from the node up to the blade. The stems of the sedges are for the most part solid, and many of them are triangular, but the most ready method of distinguishing them is by the sheath. If this is closed, forming a complete cylinder around the stem, it is a sedge, but if split on the side opposite the blade, it is not a sedge. The sedges grow abundantly in open swampy lands, and form the bulk of that poor kind of hay which in some parts of the State is called "fresh grass" or "meadow hay."

The rush family includes the bog-rushes or bull-rushes which no farmer would ever mistake for a grass, and the wood-rushes (*Luzula*), of which there are two quite common species in this State growing in pastures and worn-out lands, and a third species found on mountains, but not common. The two common species are small, less than a

foot in height, and while the flowers of the grasses have four chaffy or husk-like scales for protecting organs, the wood-rushes have six separate pieces in the protecting organs, and they have three hairy stigmas while the grasses have but two.

DEFINITION OF TERMS USED IN DESCRIBING THE GRASSES.

- Abortive.* Imperfectly formed or rudimentary.
- Alternate.* Situated regularly one above the other on opposite sides.
- Annual.* Living but one season.
- Anther.* The essential part of the stamen, which contains the pollen.
- Apex.* The top or extreme end of any part.
- Appressed.* Pressed together, not spreading.
- Aristate.* Having an awn or beard.
- Articulated.* Connected by a joint or joints.
- Ascending.* Rising obliquely from the ground.
- Awn.* A bristle-like hair proceeding from the glumes.
- Axis.* The central stem of a panicle, spike, or spikelet, on which the flowers are disposed.
- Beard.* A long slender hair or awn.
- Biennial.* Living through two seasons.
- Bifid.* Divided into two portions at the apex.
- Blade.* The expanded portion of a leaf.
- Boat-shaped.* Folded together in the form of a boat, convex on the outside and concave within.
- Branch.* A division of the stem or of the panicle.
- Branchlet.* A secondary division of the branch.
- Bristles.* Short, stiff hairs.
- Bulbous.* Thickened like a bulb.
- Capillary.* Hair-like, very slender.
- Cartilaginous.* Firm and tough, like cartilage.
- Carinate.* Keeled, having a prominent ridge in the center.
- Chaff.* The dried glumes and paleas of grasses.
- Chartaceous.* The texture resembling paper or parchment in thickness.
- Ciliate.* Having the margin or nerves fringed with hairs.
- Cobwebby.* Bearing hairs like cobwebs.
- Compressed.* Flattened laterally.
- Contorted.* Twisted.
- Convolute.* Rolled together inwards from the margin.

- Cornaceous.* Of a horn-like consistence.
- Coriaceous.* Of a leathery consistence.
- Culm.* The stalk or stem of grasses.
- Cuspidate.* Ending in a sharp, stiff point.
- Decumbent.* Reclining on the ground, but rising at the top.
- Dichotomous.* Branching in twos, two forked.
- Digitate.* Dividing from a common point.
- Diœcious.* Having the stamens and pistils on separate plants.
- Diverging.* Widely spreading.
- Dorsal.* Belonging to or growing from the back.
- Emarginate.* Having a notch at the end.
- Entire.* Without notches or divisions.
- Equal.* Alike in length.
- Exserted.* Protruded, extended beyond, standing out.
- Fertile.* Having perfect pistils, producing fruit.
- Fibrous.* Having thread-like divisions.
- Filament.* The stalk or support of the anther.
- Filiform.* Thread-like.
- Flexuous.* Bending freely, bending in a zig-zag way.
- Floret.* A name sometimes given to the flowers of grasses.
- Foliaceous.* Resembling a leaf.
- Geniculate.* Bent abruptly at an angle, like a knee.
- Glabrous.* Smooth, without hairs or roughness.
- Glaucous.* Having a light bluish-green color.
- Glomerate.* Clustered in small roundish heads.
- Glumes.* The chaff-like covering of the flowers of grasses, particularly the outer pair.
- Indigenous.* Growing naturally, not brought from some other country.
- Internode.* The space between two nodes or joints.
- Involute.* Rolled together inwards.
- Joints.* Thickenings in the stem where the leaves originate.
- Keel.* An elevated longitudinal ridge in the middle of a glume or palea, resembling the keel of a boat.
- Lamina.* The expanded portion of a leaf; the blade.
- Ligule.* A tongue-like appendage at the upper part of the sheath of a leaf.
- Line.* The twelfth part of an inch.
- Membranaceous.* Thin, like a membrane, generally somewhat translucent.

Monœcious. The staminate and pistillate flowers separate but on the same plant.

Midrib. The central and principal nerve or vein of a leaf or glume.

Mucronate. Abruptly tipped with a short awn or bristle.

Nerves. The ribs or veins of a leaf or leaf-like organ.

Neutral. Having neither stamens nor pistils.

Nodes. The thickened and solid places in the stems from which the leaves arise.

Ovary. That part of the pistil which contains the seed.

Ovule. The body which is destined to become a seed.

Palea or palet. The inner scale or chaff of the proper flower, placed nearly opposite and a little higher than the flowering glume.

Panicle. A branched and sub-divided stem bearing the spikelets.

Pedicel. A small branchlet bearing a spikelet.

Peduncle. The main stem or stalk of a flower spike.

Perennial. Living year after year indefinitely.

Perfect. Having both stamens and pistil in the same flower.

Petiole. The sheath or stem of a leaf.

Pistil. The central or female organ of a flower, that in which the seed is developed.

Pistillate. Having only pistils without stamens.

Pollen. The fertilizing powder contained in the anthers.

Pubescent. Clothed with short and soft hairs.

Radical leaves. Those growing from the base of the stem.

Rhachis or rachis. The axis or stem on which the flowers of a spikelet are arranged; also the common axis of a close spike or of a panicle.

Rhizoma or root-stock. A horizontal underground stem.

Ribs. Prominent nerves of the leaves or glumes.

Rugose. Wrinkled or furrowed.

Serrate. Having teeth on the margin, pointing towards the apex.

Sissile. Without a footstalk or pedicel.

Setaceous. Like a bristle.

Sheath. That part of the leaf which encloses the stalk.

Spike. A collection of sessile or nearly sessile flowers on a close, narrow axis.

Spikelet. A flower or cluster of flowers having one pair of outer glumes.

Stamen. The male organs of a flower, including the anther and filament.

Staminate. Having stamens only.

Sterile. Imperfect flowers not producing seed.

Style. That portion of the pistil which bears the stigmas at the top.

Truncate. Abruptly cut off at the apex.

THE COMPOSITION OF GRASSES.

It might be supposed that a chemical analysis of a grass would give an accurate idea of its value as a fodder, but there are so many conditions affecting the matter, that conclusions drawn from an analysis must be taken with great caution. The same species of grass when grown in different parts of the country, or even on different soils in the same region, often gives very different percentages of the substances of which it is composed, and the analyses of the same species grown in Europe differ widely from those of this country.

Grasses, like other plants, are made up of cells or sack-like bodies which are exceedingly small and can be seen only with high powers of the microscope. These cells are at first more or less globular, and in some parts of the plant always remain so, while in others they are more or less compressed and become twelve-sided bodies. A large number of the cells become much elongated or spindle-shaped, forming the woody tissue or woody fiber of the plant. These all consist, at first, of a thin, delicate vegetable membrane, composed of a substance called cellulose, enclosing an almost transparent semifluid substance called the protoplasm. "This protoplasm is the living portion of the plant, the active vital thing which gives to it its sensibility to heat and cold, of appropriating food and increasing its size." Its exact chemical composition has not yet been determined, but it is known to be an albuminous, watery substance combined with a small quantity of ash or mineral matter. "It is probably a complex mixture of chemical compounds and not a single compound. It contains, at some time or another, all the chemical constituents of plants. Oil, granules of starch, and other organic substances are frequently present in it, but they are to be regarded as products rather than proper constituents of protoplasm." (*Bessey*). It is known to contain carbon, hydrogen, oxygen and

nitrogen, while the cell walls or cellulose contains only carbon, hydrogen and oxygen.

As the cells grow older there is a thickening of the walls, and this deposit, which is similar in composition with the original cellulose, has been called lignine. This lignine is an indigestible substance, while a part of the cellulose is capable of being digested. It might therefore happen that many of the cells of the hay would escape being crushed during the process of mastication, and as the digestive juices of the animal do not act on the surrounding mass of lignine, the albuminoids contained within would escape and be lost to the animal. This view gives weight to the impression that late-cut hay is not as valuable as that which is cut when the grass is just in blossom.

In the cells of the young and growing parts of a plant, the albuminoids are present in abundance, but in the older parts they are present in a much smaller proportion because of the increase of the lignine, and also because of the actual transfer of the albuminoids to other parts of the plant, especially to the seeds. In case of the cereals, where the seeds are the most important part, they are allowed to remain growing in the field till this transference to the seeds is completed, but in case of the grasses used for coarse fodder, where all the plant above ground serves for food, the seeds are mostly small and the larger part of them, escaping mastication, pass through the animal undigested, and their contained albuminoids are lost, and since the albuminoids are the most valuable of the food ingredients and the most expensive to produce, it is important to cut and cure the hay at the time when the plant contains the greatest amount, and at the same time when the largest possible proportion of it is in a digestible condition.

Starchy matter is abundant in plants, and is of value as a food if supplied with a requisite amount of the albuminoids, for while animals can exist on the latter alone, it is impossible for them to exist on starch, since this substance does not furnish the nitrogen necessary to build up the tissues. Starch, as well as the fats of the plants, furnish the fat of the body and are of value for fattening animals.

In the analysis of grasses there is usually given the percentages of water, ash, fat, nitrogen-free extract, crude fiber and albuminoids. The ash contains, among other substances, a large percentage of silica deposited in the substance of the cell walls, particularly those

of the outer layer or epidermis. The fat forms but a small percentage of our grasses, and the digestibility of it has not been accurately determined. The nitrogen-free extract contains starch and sugar, vegetable mucilage and a few other substances which have a composition analogous to that of starch, and probably they are equally nutritious. In addition to these, there are varying quantities of gum-like substances and lignine, which are not digestible. The crude fiber is a mixture of cellulose and lignine, and varies with the age of the plant; the older and more mature contain a larger percentage. The albuminoids, as has been said, comprise the most valuable part of the plant for food.

SYNOPSIS OF THE GENERA OF GRASSES.

1	{ Spikelets with one flower only (Plate 3).....	2
	{ Spikelets with two or more flowers (Plate 19).....	21
2	{ Flowers arranged in panicles (Plate 19).....	3
	{ Flowers arranged in spikes (Plate 2).....	13
3	{ Flowers with awns (Plates 29 and 27).....	4
	{ Flowers without awns (Plate 2).....	10
4	{ Glumes large (Plate 35, <i>a.</i>).....	5
	{ Glumes small and unequal in length.....	9
5	{ Flowers with a copious tuft of hairs at the base, nearly equal- ling the length of the flowers (Plate 9)..	DEYEUZIA.
	{ Flowers without hairs at the base of the flowering glume....	6
6	{ Flowering glume without an awn at the end Some species of AGROSTIS.	
	{ Flowering glume with an awn at the end.....	7
7	{ Flowers with three stamens.....	8
	{ Flowers with one stamen.....	CINNA.
8	{ Flowers raised above the base of the glumes on a short stem, STIPA.	
	{ Flowers not raised above the base of the glumes, ORYZOPSIS.	
9	{ Flowers with three stamens.....	MUHLENBERGIA.
	{ Flowers with two stamens.....	BRACHYELYTRUM.
10	{ Glumes present.....	11
	{ Glumes wanting.....	LEERSIA.
11	{ Flowering glume and palea very unequal in length, AGROSTIS.	
	{ Flowering glume and palea equal in length or nearly so.....	12

- | | | | |
|----|---|--|--------------------------|
| 12 | { | Outer glumes much shorter than the flowering glume, | SPOROBOLUS. |
| | | Outer glumes about the same length as the flowering glume, | AGROSTIS and SPOROBOLUS. |
| 13 | { | Flowers with awns | 14 |
| | | Flowers without awns | 20 |
| 14 | { | Spikes solitary | 15 |
| | | Spikes two or more | ANDROPOGON. |
| 15 | { | Spikes simple or nearly so | 16 |
| | | Spikes paniculate or lobed | 18 |
| 16 | { | Involucre of two or more bristles | SETARIA. |
| | | Involucre none | 17 |
| 17 | { | Flowering glumes with awns from one to three times their length | ALOPECURUS. |
| | | Flowering glumes with awns five times their length, | HORDEUM. |
| 18 | { | Flowers without awns | HIEROCHLOA. |
| | | Flowers with awns | 19 |
| 19 | { | Only the flowering glumes awned | MUHLENBERGIA. |
| | | Flowering glume and palea both awned | ANTHOXANTHUM. |
| 20 | { | Spikes terminal, cylindrical and solitary | PHLEUM. |
| | | Spikes one-sided, several | SPARTINA. |
| 21 | { | Flowers arranged in panicles. | 22 |
| | | Flowers arranged in spikes | 33 |
| 22 | { | Flowers with awns | 23 |
| | | Flowers without awns | 28 |
| 23 | { | Flowering glume awned on the back | 24 |
| | | Flowering glume awned from the end | 27 |
| 24 | { | Awn arises near the base of the flowering glume | AIRA. |
| | | Awn arises above the middle of the back of the flowering glume | 25 |
| 25 | { | Awn arises near the middle and twisted | TRisetum. |
| | | Awn arises at or near the apex, not twisted | 26 |
| 26 | { | Spikelets from three to six flowered (Plate 29) | AVENA. |
| | | Spikelets from five to twelve flowered (Plate 22) ... | BROMUS. |
| 27 | { | Awn twisted and arising from a cleft at the end of the flowering glume | DANTHONIA. |
| | | Awn not twisted, arising from the end which is not cleft. | FESTUCA. |

- 28 { Glumes very unequal in length..... PANICUM.
 { Glumes equal in length or nearly so..... 29
- 29 { Stems of the flowers, within the glumes, hairy..... 30
 { Stems of the flowers not hairy 31
- 30 { Hairs as long as the flowers or nearly so..... PHRAGMITES.
 { Hairs much shorter than the flowers..... GRAPHEPHORUM.
- 31 { Spikelets much flattened BRIZOPYRUM.
 { Spikelets only slightly flattened..... 32
- 32 { Outer glumes longer than the flowering glume ... PHALARIS.
 { Outer glumes equal to, or shorter than the flowering glumes, 33
- 33 { Flowering glume from five to seven nerved..... GLYCERIA.
 { Flowering glume from one to five nerved..... POA.
- 34 { Stem with only one spike. 35
 { Stem with more than one spike 37
- 35 { Spikelets arranged alternately on each side. 36
 { Spikelets not arranged alternately ELYMUS.
- 36 { Spikelets with only one glume..... LOLIUM.
 { Spikelets with two glumes TRITICUM.
- 37 { Glumes present..... 38
 { Glumes wanting GYMNSTICHUM.
- 38 { Spikes slender, terminal. CYNODON.
 { Spikes somewhat globose, terminal and lateral ... DACTYLIS.

Family—GRAMINEÆ. (Grass Family.)

Genus LEERSIA, Solander.

Le-er'-si-a.

Named in honor of J. D. Leers, a German botanist.

The spikelets are one-flowered without lower glumes, and more or less crowded into one-sided, paniced spikes, in which they overlap each other more or less. The flowering glume is of the texture of paper, strongly flattened, awnless and with minute sharp bristles along the keels. The palea is of about the same length as the flowering glume, but not more than half as wide, and similarly beset with minute bristles. Only one species of this genus has as yet been reported in this State.

1. *LEERSIA ORYZOIDES*, Swartz.*Le-er'-si-a o-ry-zoi'-des.*

Common Names. Rice Cut-Grass, White Grass, Cut Grass, False Rice, Prickle Grass.

Perennial. The stems are from two to four feet high, reclining on the ground but rising near the top (decumbent); leaves from two to three lines wide, frequently a foot or more long, very rough with minute prickles along the edges and veins, while the sheaths have the prickles arising from between the veins; joints (nodes) densely covered with bristly hairs; panicles loosely branched, the lower part often covered by the sheath of the upper leaf. Spikelets somewhat spreading, flattened, from two and a half to three lines long and of a whitish color. Flowers in August and September.

This grass is common in wet places, but is not regarded of much value, yet cattle will eat it when they can get nothing better. From all accounts of its value it would seem desirable to raise some other grass in its place. I am not aware that any analysis has been made of it, or that it has been subjected to any accurate feeding tests.

Genus *ALOPECURUS*, Linneus.*Al-o-pe-cu'-rus.*

From the Greek, *alopez*, a fox, and *oura*, a tail; in allusion to the form of the spike.

The flowers are arranged in a dense, cylindrical and soft spike. Spikelets one-flowered; glumes nearly equal, boat-shaped, keeled and without awns; flowering glume with an awn which arises below the middle of the back; palea wanting; stamens three. Two species belonging to this genus are known to occur in Maine.

2. *ALOPECURUS PRATENSIS*, Linneus.*Al-o-pe-cu'-rus pra-ten'-sis.*

PLATE I.

Common Names. Meadow Foxtail, Common Foxtail Grass.

Perennial. The stems are erect and smooth, about two feet high, but in rich soil they sometimes reach three feet or even more. Leaves smooth and flat, the upper one shorter than its inflated

sheath. Spike cylindrical, obtuse, and of a yellowish green color; glumes acute, somewhat hairy; flowering glume about the same length as the outer glumes, with an awn about twice the length of the flower, arising from below the middle of the back.

This species was introduced from Europe and flowers in June and July.

This grass is rarely cultivated in this State, and perhaps for field culture will never prove as desirable as some other species, for the reason that it seldom grows more than two feet high and would not yield more than a ton to the acre, and also that it flowers so early that other grasses growing with it would not be ready to cut when this is in the best condition for hay. There is little doubt, however, that it is one of our best grasses for pastures because it endures the cropping of cattle and sheep remarkably well, and also yields a good second crop. It does not thrive well on dry, sandy soils, but is best adapted to moist, rich lands, and requires three or four years to become established and reach full perfection. In England it is regarded one of the most valuable pasture grasses, both on account of the earliness and abundance of its leafy produce, as well as from the rapid reproduction of the same when continuously eaten or cut down, and the avidity with which it is eaten by all herbivorous animals.

A chemical analysis of this grass made at the Department of Agriculture in Washington gave the following percentages: ash 7.75, fat 3.36, nitrogen-free extract 54.30, crude fibre 23.78, albuminoids 10.81. This analysis was made from grass grown in Washington and cut when it was in bloom.

3. *ALOPECURUS GENICULATUS*, Linneus.

Al-o-pe-cu'-rus gen-i-cu-la'-tus.

Common Names. Floating Foxtail, Water Foxtail Grass.

Perennial. Stems from twelve to eighteen inches high, ascending, bent at the lower joints; leaves smooth and flat, the upper one as long as its sheath. Spike slender; glumes obtuse, flowering glumes rather shorter than the outer glumes, awn extending half its length outside of the flower.

This species, which does not appear to be very common in this State, is found along the margins of pools and in wet places, often standing in the water, and flowers in June. Flint, in his Grasses

and Forage Plants, states that it is not much relished by stock of any kind, while it yields but a small amount of herbage, but this statement needs to be verified. *Alopecurus aristulatus*, Michx., now regarded as a variety of the above, occurs in Maine.

Genus PHLEUM, Linneus.

Phlé'-um.

An ancient Greek name.

The flowers are crowded into a dense, cylindrical spike; spikelets one-flowered; glumes equal in length and with a short awn or bristle on the end of each; flowering glume and palea without awns; stamens three. This genus is represented in Maine by only one species.

4. PHLEUM PRATENSE, Linneus.

Phlé'-um pra-ten'-se.

PLATE II.

Common Names. Timothy, Herds-Grass.

This perennial grass grows from two to four feet high and has a cylindrical spike from three to six inches long on the top of the stem. The glumes are of equal length and tipped with a short bristle or awn, and there is a row of fine bristles along the back. This well-known grass is more extensively cultivated in this State than any other species, and is the favorite grass, especially for horses.

Specimens of this grass, grown on heavy, clayey loam on the College farm at Orono, were cut when in full blossom and analyzed by Prof. W. O. Atwater, who obtained the following percentages: Ash 4.35, albuminoids 7.12, crude fiber 33.28, nitrogen, free extract, 53.29, fat 1.96. The average of nine different analyses made of this species cut in different stages of the growth, from Maine, New Hampshire and Connecticut, differ but little from the above.

Genus SPOROBOLUS, R. Brown.

Spo-rob'-o-lus.

Derived from the Greek, *spora*, a seed, and *ballo*, to cast out, in allusion to the fact that their seeds fall as soon as mature.

Spikelets containing one, or rarely two flowers, in an open or contracted panicle. Glumes unequal, the lower one much shorter than the upper; flowering glume and palea about equal in length.

Two species belonging to this genus are known to occur in Maine.

5. SPOROBOLUS CUSPIDATUS, Torrey.

*Spo-rob'-o-lus cus-pi-da'-tus.**Common Names.* None.

This grass has a slender, erect stem, from six to twelve inches high. The glumes are very acute and much shorter than the flowering glume and palea. These last are nearly equal in length, but the flowering glume is tipped with a sharp, stiff point (cuspidate).

This species was found at St. Francis, in Northern Maine, by Miss Kate Furbish of Brunswick. It is too small and fine to be of any great value to farmers.

6. SPOROBOLUS SEROTINUS, Gray.

*Spo-rob'-o-lus ser-ot'-i-nus.**Common Name.* Late-Flowering Sporobolus.

Stems very slender and erect, from eight to fifteen inches high. Spikelets very minute (scarcely half a line long), on very fine branchlets. Glumes ovate and obtuse, about half the length of the flowering glume.

This very delicate grass grows in sandy, wet places, and flowers in September. It is of no especial agricultural value.

Genus AGROSTIS, Linneus.

A-gros'-tis.

From the Greek, *agros*, a field, in allusion to the place of growth.

Spikelets one-flowered, and arranged in a spreading or contracted panicle. Glumes nearly equal, the lower one rather longer than the upper; the flowering glume is rather shorter than the lower glumes, and in some species has a short awn on the back. The palea is often minute and sometimes wanting. Four species of *Agrostis* are known to grow in this State and they are all of greater or less value.

7. AGROSTIS PERENNANS, Tuckerman.

*A-gros'-tis pe-ren'-nans.**Common Name.* Thin-Grass.

Stem erect, from a bent joint near the base, from one to two feet high. Panicle spreading, pale green; the branches short, divided

and flower-bearing below the middle. Flowering glume without an awn or rarely short awned, shorter than the lower glumes; palea minute or wanting.

This grass grows in damp, shady places, and flowers in July.

8. AGROSTIS SCABRA, Willdenow.

A-gros'-tis sca'-bra.

Common Names. Hair-Grass, Fly-Away Grass, Tickle Grass.

Stem very slender, erect, from one to two feet high. Flowers in a very loose, purplish panicle; the long, slim branches bear flowers at and near the end. Glumes very acute, the lower one somewhat longer than the upper one; flowering glume usually awnless, rarely with a short awn; palea wanting. The branches of the panicle and the back of the glumes are roughened with very minute bristles, because of which it received the specific name *scabra*, meaning rough. This grass is remarkable for the long and fine branches of the very loose panicle.

Common in dry places. Flowers in July and August.

Flint states that it is of no agricultural value, and Gould says that cattle dislike it.

9. AGROSTIS CANINA, Linneus.

A-gros'-tis ca-ni'-na.

PLATE III.

Common Names. Brown Bent-Grass, Dog's Bent-Grass, Mountain Red-Top.

Stem from ten to eighteen inches high, erect; the lower leaves bristle form, with their edges rolled in, those of the stem flat and wider. Panicle spreading; glumes nearly equal in length, very acute; flowering glume shorter than the lower glumes and with a very fine awn arising from the middle of the back and extending a little beyond the end of the glumes; spikelets brownish or purplish, rarely greenish.

A variety of this species called *alpina*, with a shorter and more spreading panicle, grows on mountain tops.

This grass grows mostly in mountainous regions, though sometimes in poor, wet, peaty soil. It grows in detached patches, and is seldom found in association with any other grass. Flint says it

is of no agricultural value, but it probably affords pasturage for sheep in the regions where it grows.

10. AGROSTIS VULGARIS, Withering.

A-gros'-tis vul-ga'-ris.

PLATE IV.

Common Names. Red-Top, Herds-Grass (in Pennsylvania), Fine-Top, Burden's Grass, Bent-Grass, Rhode Island Bent.

Perennial. Stems mostly erect, sometimes bent at the base, from one to two feet high or even more, growing from creeping root-stocks, which interlace so as make a firm sod. The glumes are nearly equal in size, and smooth, except along the keel, where they are somewhat roughened. The flowering glume is awnless and a little shorter than the lower glumes, while the palea is only from one-half to three-fourths as long.

Agrostis alba, L. is now regarded as a variety of the above. It differs in having a closer panicle and a longer ligule.

Agrostis vulgaris is one of the most extensively cultivated grasses in the State. It does well on any soil, but succeeds best on moist, rich land. If fed down close it is a good forage grass for pastures, but it is very apt in poor, dry pastures to send up a fine, wiry stem which the cattle avoid.

An analysis of this grass made at the Department of Agriculture at Washington, gave the following percentages: Ash 7.27, fat 2.87, nitrogen-free extract 56.82, crude fiber 22.02, albuminoids 11.02. This analysis was made of grass grown in the Department grounds in good soil, and cut when it was in full bloom. Another analysis made of grass grown in poorer soil at the same place gave, ash 5.84, fat 5.30, nitrogen-free extract 58.49, crude fiber 20.44, albuminoids 9.95. This shows that grass grown on a rich soil yields a larger percentage of the albuminoids than that grown on poor soil. This fact, together with that of an increased quantity of hay, is a strong argument in favor of high cultivation for our grass lands.

Genus CINNA, Linneus.

Cin'-na.

Derivation unknown.

Spikelets one-flowered, much flattened, in an open, spreading panicle; glumes narrow, acute, strongly keeled and beset with

bristles, the upper somewhat longer than the lower ; flowering glume raised slightly above the base of the inside of the lower glumes, and bearing a short awn on the back just below the apex ; palea slightly shorter than the flowering glume. Stamen one.

11. CINNA ARUNDINACEA, Linneus.

Cin'-na a-run-di-na'-ce-a.

PLATE V.

Common Name. Wood Reed Grass.

Stem erect, from three to six feet high ; leaves a foot long and nearly half an inch wide ; ligule conspicuously long. Panicle from six inches to a foot in length, rather dense, the branches spreading in flower and erect afterwards.

This grass grows in moist woods and shady swamps, flowering in August and September. It would furnish a large amount of fodder, but no experiments have been made to cultivate it for the purpose of ascertaining its value.

An analysis made of specimens of it collected in Indian Territory, gave, at the Department of Agriculture, the following percentages : Ash 6.69, fat 2.98, nitrogen-free extract, 54.47, crude fiber 29.64, albuminoids 6.22. We are not informed what stage it was in when collected, but the percentage of the albuminoids is high enough to make it deserving of further investigation.

Genus MUHLENBERGIA, Schreber.

Mu-len-ber'-gi-a.

Named in honor of Dr. Muhlenberg, a distinguished American botanist.

Spikelets one-flowered, arranged in contracted or rarely open panicles ; glumes mostly bristle-pointed or acute, the lower one rather smaller than the upper one, or minute ; flowering glume from three to five-nerved, mucronate or awned, sometimes with a long, fine awn from the apex between two short teeth, frequently somewhat hairy at the base ; palea nearly the same length as the flowering glume in some species but shorter in others. Stamens three. There are three species of this genus in Maine, which may be separated by the following synopsis :

- 1 { Flowering glume *sharp-pointed* at the tip. 2
 { Flowering glume with an *awn* at the tip. *M. sylvatica*.
 2 { Lower glumes *with awns* at the tip. *M. glomerata*.
 { Lower glumes *without awns* at the tip. *M. Mexicana*.

12. MUHLENBERGIA GLOMERATA, Trinius.

Mu-len-ber'-gi-a glom-e-ra'-ta.

PLATE VI.

Common Names. Spiked Muhlenbergia, Cluster-Spiked Muhlenbergia, Clustering Muhlenbergia.

Stems erect, from one to three feet high, seldom branching. Panicle from two to four inches long, composed of numerous, close clusters of flowers, forming an interrupted, glomerate spike. Glumes long, narrow and acute, equal in length, each tapering into an awn as long as the glume; flowering glume and palea unequal in length, much shorter than the glumes.

This grass grows on wet, swampy lands, and flowers in August. Dr. Vasey says that it is utilized as one of the native products of wet meadows in the making of what is called wild hay, and in Colorado and Kansas is recommended as an excellent grass for hay. Specimens from Minnesota were analyzed at the Department of Agriculture and yielded ash 15.02, fat 5.77, nitrogen-free extract, 41.21, crude fiber 17.68, albuminoids 20.32. This exceedingly high percentage of the albuminoids is certainly deserving of attention, and this species should be investigated in this State, for we are liable to find among our wild grasses some which will prove of great value.

13. MUHLENBERGIA MEXICANA, Trinius.

Mu-len-ber'-gi-a Mex-i-ca'-na.

PLATE VII.

Common Names. Wood Grass, Mexican Muhlenbergia.

Stems decumbent (reclining on the ground, the ends inclining to rise), two or three feet high, very much branched, from scaly creeping root-stocks. Panicles along the side and at the end of the stems, sometimes partially enclosed by the sheaths of the leaves. Glumes nearly equal in length, without awns but sharp-pointed, a little shorter than the flowering glume and palea, which are very acute and of equal length.

This grass grows in wet grounds and moist woods, and flowers in August.

Flint says that cattle eat it very readily, and as it blossoms late in the season it is of some value, though it is frequently regarded as a troublesome weed because of its spreading root-stocks and difficult removal.

The analysis of this grass made in Washington, of specimens from Pennsylvania, gave ash 4.33, fat 2.69, nitrogen-free extract 65.47, crude fiber 22.69, albuminoids 4.82.

14. MUHLENBERGIA SYLVATICA, Torrey and Gray.

Mu-len-ber'-gi-a syl-val'-i-ca.

PLATE VIII.

Common Names. Wood Grass, Wood Muhlenbergia.

Stems ascending, much branched, growing from two to four feet high. Panicles contracted, many-flowered; glumes nearly equal in length, bristle-pointed; flowering glume with an awn from the tip two or three times as long as the spikelet.

Grows in drier places than the preceding, and flowers in August or September.

Genus BRACHYELYTRUM, Beauvois.

Brach-y-e-ly'-trum.

Derived from the Greek, *brachys*, short, and *elytron*, a covering; in allusion to the short glumes. Spikelets one-flowered, with a conspicuous club-shaped body half as long as the palea arising on one side. Glumes very small, unequal in length, the lower almost obsolete; flowering glume five-nerved and ending in an awn which is twice as long as the flower; palea equal to the flowering glume in length. Stamens two.

15. BRACHYELYTRUM ARISTATUM, Beauvois.

Brach-y-e-ly'-trum a-ris-ta'-tum.

Common Names. Awned Brachyelytrum.

Stem simple, from two to three feet high, clothed with fine hair about the joints; leaves six inches long and from four to six lines wide, somewhat hairy. Panicle erect.

Common in rocky woods. Flowers in June and July.

Genus DEYEUXIA, Clarion.

Dey-eux'-i-a.

Spikelets one-flowered, in a contracted or open panicle. Glumes nearly equal in length, keeled, but without an awn; flowering glume hairy at the base, nearly as long as the lower glume and usually with a short, fine awn from the back, which is scarcely distinguishable from the hairs. Stamens three. There is also a small, hairy appendage at the base of the flowering glume, which is considered to be the rudiment of a second flower. Calamagrostis of the older books.

16. DEYEUXIA CANADENSIS, Beauvois.

Dey-eux'-i-a Can-a-den'-sis.

PLATE IX.

Common Names. Blue Joint-Grass, Small Reed-Grass, Canadian Small-Reed.

Stem erect, from three to five feet high; leaves a foot or more long and from a quarter to nearly half an inch wide. Panicle open and somewhat spreading, from four to six inches or more long and from two to three inches in diameter, generally of a purplish color. The spikelets are on short stalks; glumes nearly equal in length, acute and awnless; flowering glume with long white hairs from the base and also from the appendage, which reach nearly to the end, and there is a fine, inconspicuous awn arising from the back which only reaches as far as the apex. The palea is about two-thirds as long as the flowering glumes. Very common in wet places, and flowers in August.

This grass is deserving of more attention than it has generally received from the farmers in Maine. It is greedily eaten by stock in the winter, and is thought, by those who have used it most, to be as nutritious as Timothy. A chemical analysis of this species cut in Massachusetts, when in blossom, by Prof. Storer of the Bussey Institution, gave ash 4.65, fat 2.33, nitrogen-free extract, 41.23, crude fiber 44.34, albuminoids 7.45. This analysis certainly promises quite as much for this grass as has been claimed for it by those who have cut it for hay and fed it to their stock.

It seems to be a very desirable grass to grow on wet, boggy lands which are not drained.

Genus AMMOPHILA, Host.

Am-moph'-i-la.

Derived from the Greek, *ammos*, sand, and *philos*, a lover; in allusion to its growing on sandy beaches.

Flowers arranged in a dense, cylindrical, spiked panicle. Glumes nearly equal and keeled. Flowering glume and palea somewhat shorter than the outer glumes, keeled and awnless. The base of the flowering glume is beset with short hairs at the base. Leaves rolled up from their edges (convolute).

17. AMMOPHILA ARUNDINACEA, Host.

Am-moph'-i-la a-run-di-na'-ce-a.

Common Names. Sea Sand-Reed, Common Sea-Reed, Beach Grass, Mat Grass.

This is named *Calamagrostis arenaria*, Roth., in the older books,

Stems erect, rigid and solid, from two to three feet high; leaves long and smooth, tapering to a point and with their edges rolled in. Panicle from six to twelve inches long, of a whitish color, very close and spike-like. Spikelets very much compressed, about half an inch long; glumes nearly equal in length, the lower one with a single nerve, the upper with three nerves. Flowering glume and palea similar to the outer glumes, but slightly shorter, the hairs at the base less than one-third of their length. Anthers long and yellow.

Common on sandy beaches along the coast. Flowers in August. Its long creeping root-stocks and fibrous roots enable it to confine the loose sands of the beach from being washed away by the sea, and it has been planted for this purpose in Holland, France and other countries of Europe, as well as on Cape Cod and other places in this country. It is of no value as a fodder.

Genus ORYZOPSIS, Michaux.

O-ry-zop'-sis.

Derived from the Greek, *oryza*, rice, and *opsis*, resemblance; because of its resemblance to rice.

Spikelets one-flowered; glumes equal in length, partly membranaceous and without awns. Flowering glume generally awned at the tip; palea nearly of the same length as the flowering glume. Three

long scales arise from the base of the ovary. Two species belonging to this genus occur in this State and may be distinguished as follows :

Awn about twice the length of the glumes *O. asperifolia*.

Awn very short or wanting *O. Canadensis*.

18. ORYZOPSIS ASPERIFOLIA, MICHAUX.

O-ry-zop'-sis as-per-i-fo'-li-a.

Common Names. White Mountain-Rice, Large White-Grained Mountain-Rice.

Stems erect, from nine to eighteen inches high with sheaths bearing only rudimentary leaves on the upper part of the stem, those from the base bearing long and rigid leaves which are rough on the edges, pale beneath and lasting through the winter. The panicle or raceme has but few flowers. The awn arising from the tip of the flowering glume is from two to three times as long as the glume. The scales arising from the base of the grain are narrow and almost as long as the palea. "The large seeds make a very white and fine flour, but the grain drops so easily that it is impracticable to gather it in large quantities." Flint.

Common in dry woods, and flowers in June.

19. ORYZOPSIS CANADENSIS, Torrey.

O-ry-zop'-sis Can-a-den'-sis.

Common Names. Canadian Rice, Smallest Oryzopsis.

Stems slender, from six to fifteen inches high, the lowest sheaths bearing developed leaves, the upper ones with the leaves rudimentary and all of them have their edges rolled in (involute—thread-shaped). Panicle from one to three inches long, the branches usually in pairs. The flowering glume is whitish and clothed with fine, short hairs, and the awn at the tip is short, easily falls off, and is sometimes wanting.

This rare species grows on rocky hill-sides and in dry places, and flowers in June.

Nothing is known of the value of this grass.

Genus STIPA, Linneus.

Sti'-pa.

From the Greek, *stupe*, a feathery material, in allusion to some of the beautifully feathered awns in some of the species.

Spikelets one-flowered. Glumes membranaceous, shorter than the flowering glume, and without awns: flowering glume somewhat coriaceous or leathery, with a long, twisted awn at its apex. Stamens mostly three. Only one species has thus far been reported in this State,

20. STIPA RICHARDSONII, Link.

Sti'-pa Rich-ard-so'-ni-i.

Common Name. Richardson's Feather.

Stem erect, from eighteen inches to two feet high; leaves slender. Panicle loose, from four to five inches long, with slender, few-flowered branches; glumes nearly equal in length, oblong acute, two and one-half lines long, about equal in length to the pubescent, linear-oblong flowering glume, which bears a twisted awn from half to three-fourths of an inch long. Reported by C. J. Sprague as occurring on Pleasant Mountain, near Sebago Lake.

This grass is said to be worthless as a forage plant.

Genus SPARTINA, Schreber.

Spar-ti'-na.

From the Greek, *spartine*, a cord; in allusion to the cord-like appearance of these grasses.

Panicle composed of several separate, triangular spikes, along one side of which the one-flowered spikelets are arranged. Glumes strongly compressed, with a rough, bristly keel, unequal in length and without awns; flowering glume membranaceous, compressed, keeled but without an awn; palea nearly as long as the flowering glume, and with two keels.

Three species are reported in this State, which may be separated as follows:

- | | | | |
|---|---|---|---|
| 1 | { | Spikelets closely overlapping each other and very rough on the keels..... | 2 |
| | | Spikelets scarcely overlapping and nearly smooth on the keels..... | |
| | | <i>S. stricta.</i> | |

- 2 { Leaves rough along the edges. *S. cynosuroides*.
 { Leaves smooth along the edges. *S. juncea*.

21. SPARTINA CYNOSUROIDES, Willdenow.

Spar-ti'-na cyn-os-u-roi'-des.

Common Names. Fresh Water Cord-Grass, Tall Marsh Grass.

Stems erect, from two to five feet high; leaves long, and tapering to a slender point. The spikes vary in number from five to twenty, scattered and spreading. Spikelets closely overlapping each other. Glumes with long, rigid, awn-like points, the lower one equalling the length of the flowering glume.

This species grows along the banks of rivers and lakes, flowering in August.

Spartina polystachya, Willd., Salt Reed-Grass, is given in the List of Maine Plants published in 1862, but there may be some mistake about this species. This grass has the stem tall and stout, from four to nine feet high and sometimes an inch in diameter at the base. The leaves are broad and roughish underneath as well as on the margins; spikes from twenty to fifty, forming a dense oblong and purplish raceme; glumes barely mucronate, the lower one half as long as the flowering glume. Grows on salt or brackish marshes, within tide-water.

These are coarse grasses and make a very inferior quality of hay, especially if not cut early.

22. SPARTINA JUNCEA, Willdenow.

Spar-ti'-na jun'-ce-a.

PLATE X.

Common Names. Rush Salt-Grass, Marsh Grass, Salt Grass.

Stems slender, from one to two feet high; leaves narrow, very smooth and strongly involute (the edges rolled in). Spikes from one to five, on very short stems. Glumes acute, the lower one scarcely half the length of the upper, and not half the length of the flowering glume.

This grows on salt marshes and sea beaches, and flowers in August. It forms a large portion of the salt marshes near the sea-coast. Dr. Vasey says it makes an inferior hay called salt hay, which is worth about half as much per ton as Timothy or Red-Top.

23. SPARTINA STRICTA, Roth.

*Spar-ti'-na stric'-ta.**Common Names.* Salt Marsh Grass, Smooth Marsh Grass.

Stems erect, from one to four feet high, leafy to the top. Spikes from two to four except in variety *glabra*, which has from five to twelve. Spikelets loosely imbricated, or remote in variety *alterniflora*. Glumes acute, very unequal in length, the larger one a little longer than the flowering glume.

Common on salt marshes. Odor strong and rancid (Gray).

This species is greedily eaten by horses and cattle, but its strong rancid smell is said by Elliot to affect the breath, milk, butter, and even the flesh of the cattle that feed on it.

Genus CYNODON, Richard.

Cyn'-o-don.

Derived from the Greek, *kuon*, a dog, and *odous*, a tooth.

Spikelets without stems and arranged in two rows along one side of the slender spikes which are digitate (starting from one point), at the end of the stem. The spikelets are one-flowered but with the rudiments of another, in the form of a minute stem enlarged at the end, arising behind the palea and two-thirds as long.

24. CYNODON DACTYLON, Persoon.

Cyn'-o-don dac'-tyl-on.

PLATE XI.

Common Names. Bermuda Grass, Scutch Grass.

A low, creeping, perennial grass, with abundant short leaves at the base and with from three to five spikes. Glumes nearly equal in length and keeled; the flowering glume is boat-shaped, about equal in length to the palea but much broader. The palea is narrow and two-keeled.

This grass, so common in the South, is occasionally met with in Maine. Dr. Vasey says it has long been a chief reliance for pastures in the Southern States, and has been extravagantly praised by some and cursed by others who find it difficult to eradicate when once established. It rarely ripens any seed, and the usual method of reproducing it is to chop up the roots with a cutting knife, sow

them broadcast, and plow under shallow. An analysis made at the Department of Agriculture, of specimens from Alabama, gave ash 9.11, fat 1.57, nitrogen-free extract 52.61, crude fiber 23.29, albuminoids 13.42.

Genus GRAPHEPHORUM, Desvaux.

Graph-eph'-o-rum.

From the Greek, *graphis*, a pencil, and *fero*, to bear, from the tufts of hair at the base of the flowers.

Spikelets from two to five-flowered, in a narrow or loose panicle. Glume nearly as long as the spikelet; flowering glume slightly longer and larger than the palea. A tuft of fine hairs arises from the base of each flower.

25. GRAPHEPHORUM MELICOIDES, Beauvois.

Graph-eph'-o-rum mel-i-coi'-des.

Stem from one to two feet high; leaves rough; panicle open. Glumes nearly equal in length, lance-shaped, their midrib and stems rough; joints of the rhachis bearded on one side between the flowers.

This rare species has been reported from the shores of Moosehead Lake by C. E. Smith.

Genus DACTYLIS, Linneus.

Dac'-ty-lis.

Derived from the Greek, *dactylos*, a finger, in allusion to the form of the spike.

The spikelets contain from three to five flowers, and are in dense clusters at the ends of the short branches of a close, short panicle. Outer glumes nearly equal in length, acute, rigid and keeled, with from one to three nerves. Flowering glumes larger, more rigid, keeled, five-nerved, bristle-pointed and ciliate on the keel. Palea a little shorter than the glume, narrower, thinner and two-keeled.

26. *DACTYLIS GLOMERATA*, Linneus.*Dac'-ty-lis glom-er-a'-ta.*

PLATE XII.

Common Names. Orchard Grass, Rough Cock's-foot, Cock's-foot Grass.

Stems erect, about three feet high, rough; leaves broadly linear and rough; branches of the panicle naked at the base. The flowering glumes are rough and end in a sharp point or short awn. They are rather longer than the outer glumes and both are sometimes tinged with purplish.

This is one of the most valuable of all our cultivated grasses. It blossoms at the same time as red clover and makes with it an admirable hay. As a pasture grass, it is more productive than any other, but does the best under close feeding, because when suffered to grow rank or old it contains far less nutriment than when younger, and cattle, sheep and horses will not touch it, though when it is younger they eat it with the greatest avidity. It is disposed to grow in tussocks, but good preparation of the land and uniform and liberal seeding is a good preventive. It succeeds well in any soil, doing especially well in moist places, and is often sown in orchards because it grows so well even in the shade of trees.

It is singular that so valuable a grass as this should be so little cultivated by our farmers. Prof. Phares says that sheep will leave all other grasses if they can find this, and, acre for acre, it will sustain twice as many sheep or other stock as Timothy; and, further, if it is cut at the proper stage it makes a much better hay than Timothy, and is greatly preferred by animals, being easier to masticate, digest and assimilate; in fact, more like green grass in flavor, tenderness and solubility. Orchard grass is considered in England one of the most valuable of hay and pasture grasses. It forms a principal constituent of all the best natural pastures and meadows.

Specimens of this grass cut in full bloom in Washington, and analyzed at the Department of Agriculture, gave ash 8.07, fat 3.24, nitrogen-free extract 53.76, crude fiber 25.40, albuminoids 9.53.

Genus GLYCERIA, R. Brown.

Gly-ce'-ri-a.

From the Greek, *glukeros*, sweet, in allusion to the sweetish taste of the grain.

Spikelets cylindrical (terete) or flattened, several to many-flowered in a narrow or diffuse panicle, the rhachis smooth and readily disarticulating between the flowers. Glumes shorter than the flowers, unequal in length, membranaceous, from one to three-nerved and without awns; flowering glumes obtuse, awnless, more or less hyaline and denticulate at the apex, rounded (never keeled) on the back, from five to nine-nerved, the nerves separate and all vanishing before reaching the apex; palea about as long as its glume, two-keeled, entire or two-toothed at the apex.

The Maine species may be separated by means of the following table:

1	{	Leaves involute (the edges rolled in); growing in salt marshes	<i>G. maritima.</i>	
	{	Leaves flat; not growing in salt places.		2
2	{	Spikelets ovate, oblong or linear-oblong		4
	{	Spikelets long and narrow		3
3	{	Flowering glume obtuse, rather longer than the palea	<i>G. fluitans.</i>	
	{	Flowering glume acute, shorter than the palea,	<i>G. acutiflora.</i>	
4	{	Panicle open and spreading.		6
	{	Panicle long and slim		5
5	{	Spikelets three or four-flowered.	<i>G. elongata.</i>	
	{	Spikelets six or seven-flowered.	<i>G. obtusa.</i>	
6	{	Flowering glume acute or blunt-pointed, longer than the rounded palea	<i>G. Canadensis.</i>	
	{	Flowering glume truncate-obtuse; palea two-toothed.		7
7	{	Stems from three to five feet high; leaves large,	<i>G. aquatica.</i>	
	{	Stems from one to three feet high; leaves medium.		8
8	{	Spikelets numerous, bright green	<i>G. nervata.</i>	
	{	Spikelets usually few, pale green.	<i>G. pallida.</i>	

27. GLYCERIA CANADENSIS, Trinius.

Gly-ce'-ri-a Can-a-den'-sis.

PLATE XIII.

Common Names. Rattlesnake Grass, Tall Quaking Grass.

Stems erect and stout, from two to three feet high; leaves long and somewhat rough. Panicle large, loose and finally nodding, from six to nine inches long. Spikelets oblong to ovate, one-sixth of an inch long, rather swollen but flattened on the sides, from six to eight-flowered. Glumes shorter than the flowers and purplish; flowering glume somewhat longer than the rounded palea.

This species grows in wet meadows and swamps, and flowers in July. Hon. J. S. Gould says that cattle eat it very well in pasture and when made into hay. It is well adapted to low, wet lands.

28. GLYCERIA OBTUSA, Trinius.

Gly-ce'-ri-a ob-tu'-sa.

Common Name. Obtuse Spear Grass.

Stems stout and erect, from two to three feet high, very leafy; leaves long and smooth. Panicle narrowly oblong and dense, from three to five inches long; spikelets from six to seven-flowered, nearly one-fourth of an inch long; flowering glume obtuse.

Grows in bogs near the coast, and flowers in August.

29. GLYCERIA ELONGATA, Trinius.

Gly-ce'-ri-a e-lon-ga'-ta.

Common Name. Long-Panicked Manna-Grass.

Stems erect, simple, from three to four feet high; leaves about one foot long, somewhat rough. Panicle elongated, nearly a foot long and nodding, appressed; flowering glume obtuse.

Grows in wet woods and swamps. Flowers in July.

30. GLYCERIA NERVATA, Trinius.

Gly-ce'-ri-a ner-va'-ta.

PLATE XIV.

Common Names. Nerved Meadow Grass, Nerved Manna-Grass. Sometimes called Fowl Meadow Grass, but this name should only be given to *Poa serotina*.

Stems erect, from three to four feet high; leaves rather long. Panicle diffuse and at length drooping, the very numerous small spikelets ovate-oblong, from three to seven-flowered. Flowering glume truncate-obtuse, strongly seven-nerved; palea with two teeth at the apex.

Common on the margin of ponds and in wet meadows. Flowers in July.

This will undoubtedly prove a valuable grass for moist ground, and is said to succeed well on light upland soils also. It is nutritious and might be advantageously mixed with other grasses in low lands.

An analysis of this grass made at the Department of Agriculture, from specimens cut in New Hampshire, gave the following percentages. Ash 6.80, fat 2.91, nitrogen-free extract 60.01, crude fiber 21.97, albuminoids 8.31.

31. GLYCERIA PALLIDA, Trinius.

Gly-ce'-ri-a pal'-li-da.

Common Name. Pale Manna-Grass.

Stems slender, from one to three feet high, ascending from a creeping base in shallow water; leaves short, sharp-pointed and pale. Branches of the rather simple diffuse panicle erect, spreading and rough; spikelets few, from five to nine-flowered and pale; flowering glume minutely five-toothed, the palea lance-shaped, conspicuously two-toothed.

This common species flowers in July. The seeds are gathered in Holland as an article of food.

32. GLYCERIA AQUATICA, Smith.

Gly-ce'-ri-a a-quat'-i-ca.

PLATE XV.

Common Names. Reed Meadow Grass, White Spear Grass.

Stems erect and stout, from three to five feet high; leaves a foot or more long and often half an inch wide. Panicle much branched, from eight to fifteen inches long, the numerous branches ascending and spreading with age; spikelets oblong, from five to nine-flowered, usually purplish; flowering glume entire and obtuse.

Common in wet grounds. Flowers in July.

It is said that this grass is liked by cattle when made into hay.

Specimens from Vermont were analyzed at the Department of Agriculture and gave ash 7.30, fat 2.20, nitrogen-free extract 56.77, crude fiber 25.60, albuminoids 8.13.

33. GLYCERIA FLUITANS, R. BROWN.

Gly-ce'-ria flu'-i-tans.

Common Names. Floating Manna Grass, Common Manna Grass.

Stems erect or ascending, compressed, from three to five feet high; leaves from eight to twelve inches long, smooth and often floating on the surface of the water, when young. Panicle contracted, from eight to twelve inches long, the lower part somewhat concealed by the sheath of the upper leaf. Spikelets from seven to thirteen-flowered; flowering glume oblong, obtuse, or the scarious tip somewhat acutish, entire or obscurely three-lobed, usually rather longer than the blunt palea.

Common in shallow water on the margins of ponds and rivers. Flowers from June to August. It is said that this grass will bear cultivation in moderately dry grounds. There is great difference of opinion with respect to the value of this grass; some state that it is relished by cattle, while others deny this. It is evident that there is need of more careful observation and experiment before we can form opinions of its value.

34. GLYCERIA ACUTIFLORA, Torrey.

Gly-ce'-ria a-cu-ti-flo'-ra.

Common Names. Pointed Spear-Grass, Sharp-Flowered Manna-Grass.

Stems erect, somewhat compressed, about a foot and a half high ; leaves from three to six inches long. Panicle long and narrow ; spikelets from five to twelve-flowered, few and scattered ; flowering glume oblong-lanceolate, acute, shorter than the long, tapering point of the palea.

This rare species grows in wet places, and flowers in June.

35. GLYCERIA MARITIMA, Wahlenberg.

Gly-ce'-ri-a ma-rit'-i-ma.

Common Name. Sea Spear Grass.

Flowering stems erect, from a foot to a foot and a half high, the sterile shoots runner-like ; leaves mostly folded and compressed ; branches of the panicle solitary or in pairs. Spikelets oblong or linear, from four to eight-flowered ; flowering glume rounded at the upper end, slightly hairy at the base.

Common on salt marshes along the coast. Flowers in July.

Genus DISTICHLIS, Rafinesque.

Dis-tich'-lis.

Derived from the Greek, *distichos*, two rows, in allusion to the arrangement of the flowers on the spike. Spikelets dioecious, many-flowered, compressed, crowded in a dense spicate, capitate, or rather open panicle ; glumes herbaceous and narrow, keeled, acute, shorter than the flowers ; flowering glume herbaceous or membranaceous, keeled, many-nerved, acute ; palea complicate, two-keeled, the keels narrowly winged. The pistillate flowers are more rigid than the staminate.

36. DISTICHLIS MARITIMA, Rafinesque.

Dis-tich'-lis ma-rit'-i-ma.

PLATE XVI.

Common Names. Spike Grass, Salt Grass, Marsh Grass.

This is described as *Brizopyrum spicatum*, Hook, in the older books.

Stems tufted from creeping root-stocks, from nine to eighteen inches high. Spike oblong, flattened, one inch long; spikelets ovate or oblong, from five to ten-flowered; the flowers smooth and naked; grain pointed.

Grows on salt marshes and beaches. Flowers in August.

Plate 16 represents this species, a, the glumes; b, the staminate or male flower, showing the flowering glume and palea separated at the top and exposing the three stamens; c, represents the pistillate or female flower.

Dr. Vasey says that it cannot be considered a first-rate grass for agricultural purposes.

Genus *Poa*, Linneus.

Po'-a.

From the Greek, *poa*, a grass.

Spikelets somewhat compressed, from two to ten-flowered, in an open panicle; flowers generally perfect; glumes commonly shorter than the flowers, the lower one somewhat smaller than the other; flowering glume membranaceous with a scarious margin, compressed, keeled, pointless, five-nerved, often with a loose or webby mass of hair at the base; palea about the same length as the flowering glume, prominently two-nerved or two-keeled. Stems tufted.

Five species of *Poa* are known in this State, and may be separated by means of the following table:

1	{ Joints of the stem circular	2
	{ Joints of the stem flattened or compressed . . . <i>P. compressa</i> .	
2	{ Stems low, not over ten inches high	3
	{ Stems from one to three feet high	4
3	{ Mountain species; perennial <i>P. laxa</i> .	
	{ Not growing on high mountains; annual <i>P. annua</i> .	
4	{ Panicle elongated, purplish; ligule long <i>P. serotina</i> .	
	{ Panicle short pyramidal; ligule short and blunt . . . <i>P. pratensis</i> .	

37. *POA ANNUA*, Linneus.

Po'-a an'-nu-a.

Common Names. Annual Spear Grass, Low Spear Grass, Suffolk Grass.

Stems low and spreading, from three to eight inches high, from an annual or biennial root; leaves pale green and tender. Panicle

often one-sided, branches single or in pairs; spikelets crowded, very short pediceled, from three to seven-flowered. Common in fields and waste grounds. Flowers from June to September. It is very nutritious but too small to be cultivated with profit.

38. *POA COMPRESSA*, Linneus.

Po'-a com-pres'-sa.

PLATE XVII.

Common Names. Wire Grass, Flat-Stalked Grass, Blue Grass.

Stems from twelve to eighteen inches high, bent at the lower joints, arising from a running root-stock. The stems are very much flattened, especially the nodes, which character suggested the specific name. Leaves short and of a dark bluish color; panicle simple, contracted and somewhat one-sided, from one to three inches long, the short branches mostly in pairs. Spikelets almost sessile, from three to ten-flowered and much flattened. The outer glumes are acute, the flowering ones obtuse, smooth, the nerves obscure and the apex frequently purplish colored. It forms a very firm turf by means of its creeping root-stocks.

Common in fields and waste places. Flowers in June and July.

Various opinions are held as to the value of this grass. Hon. J. S. Gould says that cows fed upon it, both in pasture and in hay, give more milk and keep in better condition than when fed on any other grass, and that horses fed on this hay will do as well as when fed on Timothy and oats combined. Although it does not grow very high and yields scarcely more than a ton to the acre, yet, if the claims made for it by Mr. Gould prove true, it should certainly command the attention of our farmers, not only for field culture, but also for the pastures.

The analysis of this grass grown in Washington, gave the following results: Ash 6.08, fat 4.52, nitrogen-free extract, 58.18, crude fiber 18.53, albuminoids 12.69.

39. *POA LAXA*, Hænke.

Po'-a lax'-a.

Common Name. Few-Flowered Alpine Meadow Grass.

Stems slender, erect, from six to eight inches high; leaves numerous, narrow. Panicle somewhat raceme-like, often one-sided and

nodding; spikelets from two to four-flowered, the flowers acute, hairy and somewhat webbed at the base.

This species occurs on the tops of the higher mountains, and flowers in August.

Poa alpina, L., has been reported from Northern Maine with doubt.

40. POA SEROTINA, Ehrhart.

Po'-a se-rol'-i-na.

PLATE XVIII.

Common Names. Fowl Meadow Grass, False Red-Top, Duck Grass, Swamp Wire Grass.

Stems from two to three feet high; leaves flat, from three to six inches long; ligule elongated; panicle from six to ten inches long, the branches rough and flexuous. Spikelets from two to four-flowered, often tinged with dull purple; flowers and glumes narrow; flowering glume very obscurely nerved.

Wet meadows and along the border of streams. Flowers in July and August.

This grass will grow on almost every kind of soil, but it attains the greatest perfection in a rich, moist one. It never grows so coarse or hard but that the stalk is sweet and tender, and eaten without waste. It is easily made into hay and is a nutritive and valuable grass.

Specimens from Wisconsin were analyzed at the Department of Agriculture and gave, ash 4.23, fat 2.84, nitrogen-free extract, 65.81, crude fiber 20.85, albuminoids 6.27.

41. POA PRATENSIS, Linneus.

Po'a pra-ten'-sis.

PLATE XIX.

Common Names. Kentucky Blue-Grass, Green or Common Meadow Grass, Smooth-Stalked Meadow Grass, June Grass, Brown Top.

Stems erect, from one and a half to two feet high, sending out numerous root-stocks from the base. Panicle diffuse, pyramidal; spikelets from three to five-flowered; flowering glume five-nerved, hairy along the margins and on the keel, webbed at the base.

Common in fields everywhere. Flowers in July.

This grass has gained an almost unparalleled reputation in the West, especially in Kentucky, where it has given name to a whole section of the State—the blue-grass region—and has taken one of its common names from that State. Whatever may be its value and importance there, it surely has no such reputation in New England, and especially in Maine. For field culture, the yield per acre is much less than many other species, and further, it is attacked early in the season by a species of thrips (*Limothrips poaphagus*, Com.), a minute, orange-colored insect which conceals itself beneath the sheath of the upper leaf where it feeds on the stem just above the upper joint, completely killing the stem above, so that by haying time at least one-fourth of the grass is dead and worthless. It cannot, therefore, be advisable to cultivate this grass in Maine. It is doubtless a good grass to mix with others for lawns.

Genus *FESTUCA*, Linneus.

Fes-tu'-ca.

Latin, *Festuca*, a straw.

Spikelets from three to many-flowered; flowers not webby at the base; glumes unequal, shorter than the flowers, the lower with one nerve, the upper three-nerved, narrow, keeled acute; flowering glume membranaceous or coriaceous, narrow, rounded on the back but not keeled, more or less distinctly three to five-nerved, acute or tapering into a straight awn, rarely obtuse; palea narrow, flat, prominently two-nerved or two-keeled.

The three species now known to occur in Maine may be separated by the following table:

- | | | | | |
|---|---|---|---------------------|---|
| 1 | { | Leaves broad and flat; flowers without awns. | <i>F. elatior</i> . | |
| | | Leaves with their edges more or less rolled in; flowers with awns | | 2 |
| 2 | { | Stems growing from a dense tuft of leaves. | <i>F. ovina</i> . | |
| | | Stems not growing from a dense tuft of leaves | <i>F. tenella</i> . | |

42. *FESTUCA TENELLA*, Willdenow.

Fes-tu'-ca te-nel'-la.

Common Name. Slender Fescue-Grass.

Annual; stems slender, from five to eighteen inches high; leaves convolute bristle-form. Panicle spike-like, one-sided or more com-

pound and open; spikelets from seven to thirteen-flowered; awns equal to or shorter than the flowering glumes from which they arise. Stamens two.

Grows in dry, sterile soil, and flowers in July.

43. *FESTUCA OVINA*, Linneus.

Fes-tu'-ca o-vi'-na.

PLATE XX.

Common Name. Sheep's Fescue.

Perennial; stems tufted, erect, from six to eighteen inches high; leaves narrow, sometimes involute. Panicle from two to four inches long, the branches mostly single and alternate, erect and few-flowered; spikelets from three to eight-flowered; glumes acute and narrow; flowering glume lanceolate, roughish, with a short, rough awn not more than half the length of the flower, or shorter.

This species is very variable. It flowers in July.

It is said to form the great bulk of the sheep pastures of the highlands of Scotland, where it is the favorite food of the sheep and where it is believed to be more nutritious than any other grass. It is also said that the Tartars choose to encamp during the summer months where this grass is most abundant, because they believe that it affords the most wholesome food for their grazing animals, especially their sheep. It naturally distributes itself in dry, sandy, or rocky soils, where scarcely any other species would grow, and is without doubt our very best grass for sandy or rocky pastures, but would be of small value for field culture because of its diminutive size.

Specimens of this grass grown in New Hampshire and analyzed at the Department of Agriculture in Washington gave, ash 5.03, fat 4.26, nitrogen-free extract 84.18, crude fiber——, albuminoids 6.53, while specimens grown in Washington, cut in full bloom, gave, ash 5.60, fat 2.51, nitrogen-free extract 58.20, crude fiber 23.79, albuminoids 9.90.

44. *FESTUCA ELATIOR*, Linneus.*Fes-tu'-ca e-la'-ti-or.*

PLATE XXI.

Common Names. Meadow Fescue, Taller or Meadow Fescue.

Perennial. Stems erect, from three to five feet high; leaves about a foot long, sheaths smooth and loose. Panicle from six to eight inches long, erect, with short branches; spikelets crowded, from five to ten-flowered, the flowers rather remote, oblong-lanceolate; flowering glume five-nerved, either blunt, acute, or rarely with a very short awn.

Common in grass lands. Flowers in July; earlier than Timothy.

It succeeds best in moist, low grounds. Cattle are very fond of it, both green and when made into hay.

Specimens from Pennsylvania were analyzed at the Department of Agriculture in Washington, and gave ash 8.07, fat 4.07, nitrogen-free extract 51.59, crude fiber 22.50, albuminoids 13.77.

Genus *BROMUS*, Linneus.*Bro'-mus.*

From the Greek, *bromus*, a kind of oats.

Spikelets from five to many-flowered in a more or less open panicle; glumes unequal, shorter than the flowers, the lower from one to five, the upper from three to nine-nerved; flowering glume either convex on the back or compressed keeled, from five to nine-nerved, awned or bristle pointed from below the mostly two-cleft tip; palea rather shorter than the glumes, two-keeled, the keels rigid and ciliate.

Three species have been observed in Maine, and may be separated as follows:

Lower glume 3-5-nerved, the upper, 5-9-nerved .. *B. secalinus*.

Lower glume one-nerved, the upper three-nerved,

B. ciliatus and *B. asper*.

45. *BROMUS SECALINUS*, Linneus.*Bro'-mus se-cal'i-nus.*

PLATE XXII.

Common Names. Cheat, Chess, Willard's Brome-Grass.

Annual. Stems from two to three feet high, the nodes swollen and covered with fine short hairs; leaves broadly linear, hairy above. Panicle spreading, at length nodding, the branches nearly simple; spikelets ovate-oblong, compressed, smooth, from eight to twelve-flowered; flowering glume rather longer than the palea, with a very short awn or awnless.

A worthless plant, too common in wheat fields.

Specimens raised in New Hampshire were analyzed in Washington, by Mr. Richardson, and gave ash 7.12, fat 4.08, nitrogen-free extract 57.30, crude fiber 23.79, albuminoids 7.71.

46. *BROMUS CILIATUS*, Linneus.*Bro'-mus cil-i-a'-tus.**Common Name.* Fringed Brome-Grass.

Perennial. Stems from three to five feet high, nodes black; leaves smoothish underneath, hairy above, the lower sheaths pubescent, the upper ones smooth. Panicle compound, very loose; spikelets from seven to twelve-flowered; flowering glume with an awn at the end half its length or more; silky with closely lying hairs near the margins below.

This grass grows along river banks and in moist woods, and flowers in July and August. Not considered of any value in cultivation.

47. *BROMUS ASPER*, Linneus.*Bro'-mus as'-per.*

This rare grass is reported, in Gray's Manual of Botany, from Bethel, Maine. It is described as follows:—Culm (stem) slender and panicle smaller; spikelets five to nine-flowered; flowering glume linear lanceolate, scarcely keeled, hairy near the margins, rather longer than the awn; sheaths and lower leaves hairy or downy.

Genus PHRAGMITES, Trinius.

Phrag-mi'-tes.

From the Greek, *phragmitis*, growing in hedges.

Spikelets from three to seven-flowered, the flowers not very close to each other, their stems being covered with long silky threads nearly or quite as long as the flowers; lower glumes very unequal in length and the flowering glume is awl-shaped and three times as long as the upper.

48. PHRAGMITES COMMUNIS, Trinius.

Phrag-mi'-tes com-mu'-nis.

PLATE XXIII.

Common Name. Reed.

Stems erect, from five to twelve feet high, and an inch or more in diameter at the base; leaves from twelve to eighteen inches long and two inches wide. Panicle very large, loose, and somewhat nodding; spikelets from three to ——-flowered.

This is our largest grass and grows along the borders of streams and ponds. Although found widely distributed over the world, it does not appear to be very common in Maine. Flowers in August. This grass is of no value for fodder, but is used in some countries for thatching the roofs of houses, for light fences and for screens.

Genus LOLIUM, Linneus.

Lo'-li-um.

The ancient Latin name.

Spikelets several-flowered and arranged alternately at each point of the rhachis of the simple spike placed edgewise against the rhachis. Inner glume wanting, except in the upper spikelet.

49. LOLIUM PERENNE, Linneus.

Lo'-li-um pe-ren'-ne.

PLATE XXIV.

Common Names. Rye Grass, Ray Grass, Common Darnel, Italian Rye Grass, Perennial Rye Grass.

Perennial. Stems erect, from one to two feet high. Glumes shorter than the spikelet; flowers from eight to twelve in each

spikelet, with or without short awns. Fields and pastures. Introduced from Europe. Flowers in July.

This is one of the most important grasses in England, occupying the same place there that Timothy does here. Hon. J. S. Gould says that the valuable qualities of this grass may be summed up as follows: Its habit of coming early to maturity; its rapid reproduction after cutting; its wonderful adaptation to all domestic animals, which is shown by the extreme partiality they manifest for it, either alone or when mixed with other grasses, whether when used as green food for soiling, as hay or as pasturage, in which latter stage its stems are never allowed to ripen and wither like those of other grasses. One of its greatest recommendations is its beneficial influence on the dairy, not only in augmenting the flow of milk, but in improving the flavor of the cheese and butter that are made from it. Morton, in the British Cyclopædia of Agriculture, writes in similar high terms of praise. The literature on this grass, extolling its excellent qualities, is very extensive, and there is no doubt that this species deserves the attention of our farmers. The variety known as *Lolium Italicum* is regarded by many as the more desirable of the two. Analyses, made in Washington, give for *L. perenne*, ash 7.50, fat 2.64, nitrogen-free extract 56.84, crude fiber 25.42, albuminoids 7.60, and for *L. Italicum*, ash 11.02, fat 2.32, nitrogen-free extract 51.73, crude fiber 20.44, albuminoids 14.49. The first was cut "after bloom" and the last "in full bloom."

Genus AGROPYRUM, Beauvois.

Ag-ro-py'-rum.

Spikelets from three to nine-flowered or more, compressed, alternately sessile on the continuously or slightly-notched rachis of the simple spike, and with the side against the rachis. Glumes nearly equal and tapering to a point, or awned.

This genus includes a part of the species formerly contained in the Linnean genus *Triticum*, and under which our species will be found in the older works.

50. AGROPYRUM REPENS, Linneus.

Ag-ro-py'-rum ré-pens.

PLATE XXV.

Common Names. Witch Grass, Couch Grass, Quitch Grass, Quick Grass, Quack Grass, Wheat Grass, Twitch Grass, Dog Grass, Chandler Grass, Quake Grass, Squitch Grass.

Perennial. Stems from one to three feet high, from fibrous roots, and sending out long running root-stocks under the surface of the ground by means of which it multiplies rapidly. Spikelets from four to eight-flowered; awn shorter than the flower, or none. This variable species is common throughout the State, and flowers in July.

Much has been said and written for and against this grass, some pronouncing it one of the vilest of weeds, while others claim for it high nutritive qualities sufficient to out-weigh all the disadvantages of its growth. No one will deny that in lands where alternate husbandry is practiced, it is an evil of great magnitude, and when we have such a long list of most excellent grasses adapted respectively to every possible condition of soil in the State, from the mountains and rocky pastures down to the lowest swamp lands in our fields, it seems wholly unnecessary to cultivate this grass. An analysis of specimens of this grass cut in Maine, was made at the Department of Agriculture in Washington, and gave ash 7.28, fat 3.83, nitrogen-free extract 50.95, crude fiber 25.30, albuminoids 12.64. Specimens from other States gave quite different results, in all cases a much smaller percentage of albuminoids.

51. AGROPYRUM CANINUM, Linneus.

Ag-ro-py'-rum ca-ni'-num.

Common Names. Fibrous-Rooted Wheat Grass, Awned Wheat Grass.

Stems arising from fibrous roots but without root-stocks. Spikes more or less nodding, rather dense, from three to six inches long. Spikelets from three to five-flowered; awns fully twice the length of the flowering glume. This is apparently a rare plant in Maine.

Genus HORDEUM, Linneus.

Hor'-de-um.

The ancient Latin name for barley.

Flowers arranged in a dense spike with two or three spikelets at each joint of the notched rhachis; spikelets one-flowered, with an awl-shaped rudiment of a second flower, the central spikelet of the cluster perfect and sessile, the lateral ones short-stalked and imperfect or abortive; glumes slender and bristle-form. Stamens three.

52. HORDEUM JUBATUM, Linneus.

Hor'-de-um ju-ba'-tum.

Common Name. Squirrel-Tail Grass.

Annual. Stems erect, from four to ten inches high; perfect flowers bearing awns two inches long, about the same length as the similar glumes, all spreading.

This worthless grass is common in marshes and moist sand of the sea shore.

Genus ELYMUS, Linneus.

El'-y-mus.

From the Greek *elumos*, a kind of grain.

Spikelets from two to four at each joint of the rhachis of the simple stout spike, sessile, from one to six-flowered; glumes two for each spikelet, nearly side by side in its front, forming a kind of involucre for the cluster, narrow, rigid, from one to three-nerved, acuminate or awned; flowering glume herbaceous, rather shorter, oblong or lanceolate, rounded on the back, not keeled, acute or awned; palea shorter, two-keeled. Three species occur in Maine, which may be separated as follows:

- | | | | | |
|---|---|--|-----------------------|---|
| 1 | { | Flowers and glumes without awns | <i>E. Mollis.</i> | |
| | { | Flowers and glumes, one or both, with awns | | 2 |
| 2 | { | Spikes, two to three inches long, upright, partly enclosed in the upper sheath | <i>E. Virginicus.</i> | |
| | { | Spikes, five to nine inches long, nodding, not enclosed in the upper sheath | <i>E. Canadensis.</i> | |

53. *ELYMUS VIRGINICUS*, Linneus.*El'-y-mus Vir-gin'-i-cus.*

PLATE XXVI.

Common Names. Smooth Rye-Grass, Virginian Lyme-Grass, Wild Rye-Grass, Terrell Grass.

Perennial. Stem erect, from two to four feet high; leaves broadly linear, bright green, rough; spike rigidly erect, thick, from two to three inches long, on a short stem usually included in the sheath of the upper leaf; spikelets mostly in pairs from two to three-flowered, the flowers nearly smooth; glumes lanceolate, strongly nerved and bristle-pointed; flowering glume obscurely nerved and ending in a slender awn.

This grass is not uncommon along the moist banks of streams, and flowers in August. Flint says it is of no special value as an agricultural grass, but it is claimed in the Southern States that it is a good pasture grass.

54. *ELYMUS CANADENSIS*, Linneus.*El'-y-mus Can-a-den'-sis.*

PLATE XXVII.

Common Names. Wild Rye, Canadian Lyme-Grass, Terrell Grass.

Perennial. Stems erect, from three to four feet high; leaves broadly linear; spikes from five to nine inches long, nodding at the top, on a long stem (peduncle.) Spikelets mostly in pairs, each of which contains from three to five long-awned, rough flowers; the awl-shaped glumes are tipped with shorter awns.

Grows along the banks of streams, and flowers in August. Not common. Probably of no greater value than *E. Virginicus*.

Specimens from the Indian Territory were analyzed in Washington, and gave ash 5.99, fat 3.71, nitrogen-free extract 50.78, crude fiber 34.66, albuminoids 4.86.

55. *ELYMUS MOLLIS*, Trinius.*El'-y-mus mol'-lis.*

Common Name. Soft Lyme-Grass.

Perennial. Stems from three to five feet high, velvety at the top; spike thick, erect, eight inches long; spikelets, two or three

at each joint, from five to eight-flowered; glumes one inch long, from five to seven-nerved, lanceolate-pointed and awnless; flowering glume and palea pointed and soft, but awnless. Grows along the shores of lakes; not common.

Genus ASPRELLA, Willdenow.

As-prel'-la.

Spikelets two or three, sometimes solitary at each joint of the rhachis, raised on a very short pedicel, loosely two to four-flowered (when solitary, flatwise on the rhachis), in a loose terminal spike. Glumes none or small, awn-like and deciduous.

56. ASPRELLA HYSTRIX, Willdenow.

As-prel'-la hys'-trix.

Common Name. Bottle-Brush Grass.

Perennial. Stems erect, from two to four feet high; leaves broadly linear; spike from three to six inches long; spikelets two or three at each joint of the rhachis, at first erect, but soon spreading almost horizontally, usually three-flowered, the flowers tipped with an awn twice their length.

Moist woods. Flowers in August. This species is known in some of the older books by the name of *Gymnostichum Hystrix*.

Genus DANTHONIA, DeCandolle.

Dan-tho'-ni-a.

Named in honor of M. Danthoine, a French botanist.

Spikelets from three to ten-flowered, in a panicle or simple raceme, the rhachis hairy and produced beyond the flowers in a stipe or imperfect flower; glumes narrow, keeled, acute, usually as long as the spikelet; flowering glume convex on the back, of firm texture, from seven to nine-nerved, with two rigid terminal teeth or lobes, and with a flattened, twisted, and bent awn between the teeth; palea broad, two-keeled, obtuse or two-pointed.

57. *DANTHONIA SPICATA*, Beauvois.*Dan-tho'-ni-a spi-ca'-ta.*

PLATE XXVIII.

Common Names. Wild Oat-Grass, Wire Grass, Spiked Wild Oat-Grass, White Top, Old Fog. We have heard this grass called June Grass in some parts of the State.

Perennial. Stems erect, slender, from twelve to eighteen inches high; leaves very narrow, flat or involute, more or less hairy, the lower ones numerous; spikelets few; flowering glume hairy.

This grass is common in dry open woods and fields on poor worn-out soils. Flowers in July. We have always considered this to be rather an inferior kind of grass, yet there are some farmers who hold it in high esteem! Dr. Vasey, of the Department of Agriculture, Washington, D. C., one of the highest authorities on the grasses, says it is a grass of very little value. Hon. J. S. Gould says he once had a field which, in one very dry season, bore scarcely anything but this grass. The scythes had to be ground twice a day or they would slip over the slender stems without cutting them. When it was fed to cattle in the winter, although the mangers were kept well filled, they bellowed with hunger. The horses became hide-bound, and the cows shrank in their milk. It was rather better than rye straw, but not much. Specimens from New Hampshire were analyzed in Washington, and gave ash 4.38, fat 3.80, nitrogen-free extract 56.92, crude fiber 29.11, albuminoids 5.79.

Genus *AVENA*, Linneus.*A-ve'-na.*

The ancient Latin name for oats.

Spikelets from three to many-flowered, in an open panicle, the flowers becoming of a harder texture than the large and nearly equal lanceolate, acute glumes; flowering glume with two teeth at the end and a twisted awn arising from the back.

To this genus belongs the oats (*Avena sativa*, L.) of cultivation.

58. *AVENA STRIATA*, Michaux.*A-ve'-na stri-a'-ta.*

PLATE XXIX.

Common Names. Wild Oat-Grass, Purple Wild-Oats.

Perennial. Stems erect, simple, smooth, from one to three feet high; leaves long and smooth, the sheaths close and conspicuously striate. Spikelets from three to six-flowered, much exceeding the length of the acute, purplish glumes: lower glume one, the upper three-nerved; flowers short-bearded at the base.

Grows on rocky and shady hills. Flowers in July.

Its productiveness and agricultural value have not been tested.

Vermont specimens analyzed at the Department of Agriculture, gave ash 4.96, fat 4.00, nitrogen-free extract 56.13, crude fiber 26.16, albuminoids 8.75.

Genus *TRisetum*, Persoom.*Tri-se'-tum.*

From the Latin, *tris*, three, and *seta*, a bristle, in allusion to the three bristles of the flower.

Spikelets two or three, rarely five-flowered, in a dense or open panicle, the rhachis usually hairy and produced into a bristle at the base of the upper flower; glumes unequal, acute, keeled, membranaceous, with scarious outer margins. Flowering glume of similar texture, keeled, acute, the apex two-toothed, the teeth sometimes prolonged into bristle-like points, the middle nerve with an awn attached above the middle, usually twisted at the base and bent at the middle; palea hyaline, narrow, two-nerved and two-toothed.

59. *TRisetum SUBSPICATUM*, Beauvois.*Tri-se'-tum sub-spi-ca'-tum.*

PLATE XXX.

Perennial. Stems erect, about a foot high; leaves short and flat; minutely soft, downy; panicle dense, much contracted, oblong or linear, from two to three inches long; glumes about the length of the two or three flowers; awn diverging. Grows on mountains and river banks. Flowers in July. Not a common grass in Maine, but should it receive attention, it might prove a valuable grass for high pastures.

Genus DESCHAMPSIA, Beauvois.

Des-champ'-si-a.

Spikelets from two three-flowered; glumes unequal in length; flowering glume thin, membranaceous, and with an awn at the back below the middle. Panicle compound, usually spreading, the third, when present, imperfect. The species here are to be found under the genus *Aria* in the older books.

60. DESCHAMPSIA FLEXUOSA, Linneus.

Des-champ'-si-a flex-u-o'-sa.

Common Names. Common Hair-Grass, Wood Hair-Grass.

Perennial. Stems from one to two feet high, smooth and slender; leaves mostly in a tuft from the base, very slender and with the edges rolled in from one to six inches long. The awn is longer than the flowering glume, at length becoming bent and twisted.

This species grows in dry, sandy or rocky places, and flowers in June.

Sheep are said to be fond of this grass, but as it affords only a small amount of feed, it is not worth cultivating.

61. DESCHAMPSIA CÆSPITOSA, Linneus.

Des-champ'-si-a cæs-pi-to'sa.

PLATE XXXI.

Common Names. Hair Grass, Tufted Hair Grass.

Perennial. Stems tufted, from two to four feet high; leaves flat, linear, rough above and smooth beneath. Panicle pyramidal or oblong, six inches long; awn straight, barely equalling the flowering glume. Shores of lakes and streams. Flowers in July.

Genus HOLCUS, Linneus.

Hol'-cus.

Said to have been derived from the Greek, *holko*, to extract, because of its supposed virtue in drawing out thorns.

Spikelets two-flowered, crowded in an open or contracted panicle; the boat-shaped glumes nearly equal and somewhat compressed, enclosing and much exceeding the enclosed flowers, which are a

little remote from each other. The lower flower is perfect, but the upper one is staminate only and has a stout bent awn below the apex.

62. *HOLCUS LANATUS*, Linneus.

Hol'-cus lan-a'-tus.

PLATE XXXII.

Common Names. Velvet Grass, Meadow Soft Grass, Velvet Mesquite Grass.

Perennial. Stems from one to three feet high, the whole plant clothed with a soft whitish down.

Found occasionally in fields with other grasses. Flowers in July. This is regarded as an undesirable grass, and should be kept out. An analysis made of it in Washington gave ash 8.23, fat 3.89, nitrogen-free extract 55.52, crude fiber 25.01, albuminoids 7.35.

Genus *HIEROCHLOA*. Gruelin.

Hi-e-rock'-lo-a.

From the Greek, *hieros*, sacred, and *chloa*, grass, because it is used in certain religious festivals in Germany.

Spikelets three-flowered, the two lower flowers staminate, and having three stamens, mostly awned; the upper flower perfect but having only two stamens, and without awns. Smooth perennial grasses having the odor of vanilla.

63. *HIEROCHLOA BOREALIS*, R. and S.

Hi-e-rock'-lo-a bo-re-a'-lis.

PLATE XXXIII.

Common Names. Vanilla Grass, Seneca Grass, Holy Grass.

Stems simple, erect, from twelve to eighteen inches high; leaves smooth and shining, the lower ones very long, while those of the stem are short. Panicle somewhat one-sided, pyramidal, from two to five inches long; peduncles smooth; perfect flower pointless, staminate flowers slightly awned, spikelets chestnut colored. Grows in wet lands, and flowers in June.

This grass is remarkably sweet-scented and is used by the Penobscot Indians, in the manufacture of baskets, but does not appear to be of any value as a fodder.

Specimens from Illinois gave ash 9.32, fat 4.06, nitrogen-free extract 49.45, crude fiber 23.02, albuminoids 14.15.

64. *HIEROCHLOA ALPINA*, R. and S.

Hi-e-rock'-lo'-a al-pi'-na.

Common Name. Alpine Holy Grass.

Stems erect, from six to twelve inches high; stem-leaves short. Panicle contracted, from one to two inches long; spikelets oblong, compressed, longer than the pedicels.

This species grows on the summits of mountains and flowers in July.

Genus *ANTHOXANTHUM*, Linneus.

An-thox-an'-thum.

From the Greek, *anthos*, a flower, and *xanthos*, yellow.

Panicle somewhat spiked; spikelets three-flowered, the two lower ones represented only by a single-awned flowering glume each, which are hairy on the outside and notched at the end, from the bottom of which the awns arise. The upper glume is fully as long as the flowers, somewhat hairy and twice the length of the lower glume. Stamens three.

65. *ANTHOXANTHUM ODORATUM*, Linneus.

An-thox-an'-thum o-do-ra'-tum.

PLATE XXXIV.

Common Names. Sweet Vernal Grass, Sweet-Scented Vernal Grass.

Perennial. Stems erect, slender, from twelve to eighteen inches high; leaves more or less pubescent; ligule elongated. Panicle usually contracted into more or less of a spike which is of a brownish color or tinged with green; flowers pubescent, shorter than the awns.

Common in fields and pastures; flowers in June and July.

This grass is very sweet-scented in drying. It is nowhere considered a valuable grass, for the yield is very light. It is much used to mix with other species on lawns. Specimens of this grass from New Hampshire were analyzed in Washington, and gave ash 8.43, fat 3.41, nitrogen-free extract 53.81, crude fiber 25.79, albuminoids 8.56.

Genus PHALARIS, Linneus.

Phal'-a-ris.

From the Greek, *phalos*, shining, in allusion to the smooth surface of the flowering glume. Spikelets crowded in a clustered or spiked panicle, apparently one, but really three-flowered, the two inferior flowers scale-like and minute, the upper flower perfect. Glumes equal, keeled and awnless.

66. PHALARIS CANARIENSIS, Linneus.

Phal'-a-ris ca-na-ri-en'-sis.

Common Name. Canary Grass.

Annual. Stems simple and smooth, from eighteen inches to two feet high; leaves one-third of an inch wide, pale green, the sheaths somewhat inflated. Panicle spike-like, oval; glumes boat-shaped, entire at the point, yellowish green; flowering glume and palea hairy.

Grows about houses where the seeds have been scattered. Flowers from July to September. Cultivated occasionally for the seed, which is considered the best food for Canary birds. Hon. J. S. Gould says that cattle are very fond of it when it is young, but the yield is too small to be profitable.

67. PHALARIS ARUNDINACEA, Linneus.

Phal'-a-ris a-run-di-na'-ce-a.

PLATE XXXV.

Common Names. Reed Canary-Grass, Ribbon Grass.

Perennial. Stems erect and smooth, from two to four feet high; leaves one-third of an inch wide, smooth, with rough edges. Panicle from two to five inches long, ovoid, a little spreading when old; glumes boat-shaped, obtusely keeled. Wet grounds. Flowers in July.

In variety *picta*, the leaves are striped with white. This is the common Ribbon-Grass of the gardens, which, if planted in low or wet grounds will change to the original grass again.

This grass is said to be extensively used in Sweden for fodder, but in this country cattle will not eat it if they can get anything

better. An analysis of this grass, "in bud," was made by Prof. F. H. Storer, and gave ash 6.63, fat 2.99, nitrogen-free extract 42.93, crude fiber 36.39, albuminoids 11.06.

Genus PANICUM, Linneus.

Pan'-i-cum.

Said to be derived from the Latin, *panis*, bread; the grain of some species being used for food.

The flowers are arranged in panicles in some species and in spikes in others. Spikelets two-flowered, naked, the flowers with or without awns; the lower one staminate or neutral, the upper one perfect.

Nine species of this genus have been reported in this State thus far, and these may be distinguished by the following table:

1	{ Flowers with awns.....	<i>P. crus-galli.</i>	
	{ Flowers without awns.....		2
2	{ Spikelets crowded on one-sided spikes.....	<i>P. glabrum.</i>	
	{ Spikelets scattered in panicles		3
3	{ Panicle elongated, wand-like or pyramidal.....		4
	{ Panicle short or small, loosely spreading.....		5
4	{ Sheaths, and usually the leaves, very hairy	<i>P. capillare.</i>	
	{ Sheaths and leaves not hairy.....	<i>P. virgatum.</i>	
5	{ Leaves wide, with from nine to fifteen nerves.....		6
	{ Leaves narrow, with few or indistinct veins		8
6	{ Outside of the sheaths smooth	<i>P. latifolium.</i>	
	{ Outside of the sheaths rough with minute bristles.....		7
7	{ Base of the leaves heart-shaped and clasping; about an inch wide.....	<i>P. clandestinum.</i>	
	{ Base of the leaves not heart-shaped and clasping; about half an inch wide.....	<i>P. xanthophysum.</i>	
8	{ Stems short and tufted	<i>P. depauperatum.</i>	
	{ Stems taller and nearly simple	<i>P. dichotichum.</i>	

68. PANICUM GLABRUM, Gaud.

Pan'-i-cum gla'-brum.

Common Name Smooth Crab-Grass.

Annual. Stems from five to twelve inches long, spreading, prostrate or sometimes erect. Spikes three or four in number, spread-

ing, from two to six inches long, diverging, nearly digitate. Spikelets ovoid; lower glume wanting, the upper one equalling the flower. A troublesome weed. Grows in waste and cultivated grounds, and flowers from August to October.

69. *PANICUM CAPILLARE*, Linneus.

Pan'-i-cum cap-il-la'-re.

PLATE XXXVI.

Common Names. Old-Witch Grass, Hair-Stalked Panic-Grass.

Annual. Stems from one to two feet high, often branching at the base and forming a tuft; leaves flat, one-third of an inch wide and hairy; the sheaths clothed with rigid, spreading hairs. Panicle in the form of a pyramid, expanding, loose; glumes often purplish.

Sandy soils and cultivated fields. Flowers in August and September.

This is one of the most worthless of grasses, and is generally rejected by cattle. Specimens from the Indian Territory were analyzed at the Department of Agriculture, and gave ash 5.59, fat 3.89, nitrogen-free extract 55.30, crude fiber 28.24, albuminoids 6.98.

70. *PANICUM VIRGATUM*, Linneus.

Pan'-i-cum vir-ga'-tum.

PLATE XXXVII.

Common Names. Tall Panic-Grass, Tall Smooth Panic-Grass, Switch Grass.

Perennial. Stems from three to five feet high; leaves very long and flat, of a yellowish tinge when old; ligule silky bearded; whole plant very smooth; panicle diffuse, very large; spikelets scattered, usually purplish, the lower flowers staminate, with the flowering glume and palea nearly equal.

Moist, sandy soil, flowering in August. Dr. Vasey says this is a good and prolific grass if cut when young; when ripe it becomes harsh and unpalatable. Texas specimens gave ash 7.24, fat 1.66, nitrogen-free extract 49.39, crude fiber 36.78, albuminoids 4.93.

71. *PANICUM LATIFOLIUM*, Linneus.*Pan'-i-cum lat-i-fo'-li-um.**Common Name.* Broad-Leaved Panic-Grass.

Perennial. Stems erect, smooth, simple or somewhat branching, from one to two feet high. The joints and throat of the sheaths bearded with soft, woolly hairs; leaves, often one inch wide, broadly oblong-lanceolate from a heart-shaped, clasping base. Panicle terminal, partially enclosed by the sheath of the upper leaf; spikelets obovate and downy.

Grows in moist woods, and flowers in July and August. Flint says it is of no value for cultivation.

72. *PANICUM CLANDESTINUM*, Linneus.*Pan'-i-cum clan-des-ti'-num.**Common Name.* Hidden-Flowered Panic-Grass.

Perennial. Stems from one to three feet high, erect, rigid, very leafy to the top; leaves from three to six inches long and an inch or more wide; strongly nerved, smooth or slightly hairy above, with a heart-shaped, clasping base; joints naked, with papillæ bearing very stiff and spreading bristly hairs; lateral and also terminal panicle more or less enclosed in the sheaths; spikelets ovoid, often smooth; lower flowers neutral.

Grows in low thickets and on river banks. Flowers in July and August.

73. *PANICUM XANTHOPHYSUM*, Gray.*Pan'-i-cum xan-tho-phy'-sum.**Common Name:* Yellow Panic-Grass.

Perennial. Whole plant light green, becoming yellowish in drying; stems from twelve to fifteen inches high, slender and smooth; leaves from three to six inches long and about half an inch wide; sheaths hairy. Panicle nearly simple, few-flowered, on a long, naked, slender peduncle; spikelets globose-obovate, pubescent, the lower glume about one-third the length of the upper one; lower flower staminate.

Grows on dry, sandy soils, and flowers in June. Rare.

74. *PANICUM DICHOTOMUM*, Linneus.*Pan'-i-cum di-choi'-o-mum.**Common Name.* Polymorphus Panic-Grass.

Perennial. Stems from eight inches to two feet high, at first simple, mostly erect, but sometimes procumbent. Radical leaves short and very broad, often purplish and usually smooth, those of the stem narrower and much longer, spreading, smooth or hairy; sheaths pubescent or sometimes smooth. Spikelets minute, on long peduncles, obovate, mostly pubescent, lower glume one-third the length of the upper; lower flower neutral. This is an extremely variable species.

Moist meadows, fields and woods. Flowers from July to September.

75. *PANICUM DEPAUPERATUM*, Muhlenberg.*Pan'-i-cum de-pau-per-a'-tum.**Common Names.* Worthless Panic, Few-Flowered Panic-Grass.

Perennial. Stems from eight to fifteen inches high; lowest leaves short and near together, upper ones from three to six inches long, pale green, more or less hairy underneath, smooth above, fringed with a few long hairs towards the base, involute when old; sheaths about two inches long, on a slender peduncle, the branches mostly clothed more or less with rather stiff, spreading hairs. Panicle in pairs; spikelets somewhat acuminate when dry, conspicuously striate.

Dry woods and highlands. Flowers in June.

76. *PANICUM CRUSGALLI*, Linneus.*Pan'-i-cum crus-gal'-li.*

PLATE XXXVIII.

Common Names. Barnyard Grass, Barn Grass.

Annual. Stem from two to four feet high, stout, erect or somewhat procumbent; leaves half an inch or more in breadth. Panicle dense pyramidal, the spikelets crowded in dense, spike-like racemes; glumes acute, the awn variable in length and sometimes wanting; flowering glume of the neutral flower usually awned; perfect flowers smooth and coriaceous.

Very common everywhere in moist, rich lands. Flowers in August and September.

This grass is regarded as a mere weed in this State, but in the South it is cultivated to some extent for fodder. Specimens from Pennsylvania were analyzed in Washington, and gave ash 11.82, fat 2.49, nitrogen-free extract 47.77, crude fiber 25.32, albuminoids 12.60.

Genus SETARIA, Beauvois.

Se-ta'-ri-a.

From the Latin *seta*, a bristle, in allusion to the bristly spikes.

Spikelets in a cylindrical spike-like, or sometimes interrupted panicle. Below the spikelets there are several bristles, which remain after the spikelets fall off. The spikelets contain two flowers (apparently only one), the upper one perfect, the lower one male or sterile; glumes nearly equal in length, much shorter than the flowers. Three species occur in Maine, and may be separated as follows:

- | | | | |
|---|---|--|--------------------|
| 1 | { | Spike (or panicle) nodding from four to six inches long. | |
| | | | <i>S. Italica.</i> |
| | | Spike erect, from two to three inches long | 2 |
| 2 | { | Spike tawny yellow | <i>S. glauca.</i> |
| | | Spike green | <i>S. viridis.</i> |

77. SETARIA GLAUCA, Beauvois.

Se-ta'-ri-a glau'-ca.

PLATE XXXIX.

Common Names. Foxtail, Bottle Grass, Pigeon Grass.

Annual. Steins erect, from one to three feet high; leaves hairy at the base; sheaths smooth; ligule bearded. Spike cylindrical, simple, tawny. from two to three inches long; from six to ten bristles arise from the base of each spikelet, two or three times as long as the spikelets, which are rough upwards and of a tawny or dull orange yellow color when old. Fields and cultivated grounds. Flowers in August.

This grass has been regarded as a worthless weed, but Dr. Warder stated that he had a luxuriant growth of it in one of his corn fields; that he mowed it and made it into hay. To his great surprise, he found that in the winter season his cattle ate it voraciously; they

would leave Blue Grass and Timothy at any time to eat it. The seeds are said to be excellent for turkeys and chickens. Dr. Vasey says this grass is as nutritious as Hungarian Grass, but not as productive. An analysis of this grass made at the Department of Agriculture gave ash 7.27, fat 2.66, nitrogen-free extract, 55.28, crude fiber 25.75, albuminoids 9.04.

78. SETARIA VIRIDIS, Beauvois.

Se-ta'-ri-a vir'-i-dis.

Common Names. Green Foxtail, Bottle Grass.

Annual. Stems from two to three feet high, erect, mostly simple : spike cylindrical, green, from two to three inches long ; bristles from four to ten arising from the base of each spikelet. Cultivated fields. Flowers in August. The seeds are eaten by poultry and birds.

79. SETARIA ITALICA, Kunth.

Se-ta'-ri-a Ital'-i-ca.

PLATE XL.

Common Names. Hungarian Grass, Italian Millet, German Millet.

Annual. Stems erect, stout, from two to four feet high, with numerous long and broad leaves and a terminal, spike-like, nodding panicle, from four to six inches long and often an inch or more in diameter. The panicle is composed of a great number of small, closely crowded branches, each of which consists of a small group of several clusters of spikelets at the base of which arise two or three bristles, sometimes long and sometimes short. This variable species has been considered, until recently, to comprise more than one species, but botanists now regard the different forms as only varieties of one species. It owes its value as a fodder plant to the abundance of its foliage and to the large amount of seed produced. Prof. Phares states that for forage it should be cut as soon as it blooms, when, of course, it is worth nothing for seed, but is most valuable for forage and exhausts the land much less. If left for the seed to mature they are very abundant and rich feed, but the stems are worthless, while the soil is more damaged. Specimens

from Pennsylvania were analyzed at Washington, and gave ash 7.50, fat 2.71, nitrogen-free extract 55.78, crude fiber 24.52, albuminoids 9.45.

Genus ANDROPOGON, Linneus.

An-dro-po'-gon.

From the Greek, *aner*, man, and *pogon*, a beard, in allusion to the hairy flowers.

Spikelets arranged in simple or paniced spikes. Spikelets in pairs in the alternate notches of the rhachis, one sessile and perfect, the other pediceled and staminate or neuter. Fertile spikelet with two more or less coriaceous glumes and with the palea awned at the tip.

Spikes two to five from one point (digitate). *A. furcatus*.

Spikes distinct, not from one point. *A. scoparius*.

80. ANDROPOGON FURCATUS, Muhlenberg.

An-dro-po'-go fur-ca'-tus.

PLATE XLI.

Common Names. Blue Stem, Finger-Spiked Wood-Grass.

Perennial. Stems erect, from three to four feet high, the naked top of the stem terminated by from two to five rigid spikes. Spikelets approximate, appressed; hairs at the base of the fertile spikelet, on the rhachis and on the stout pedicel of the awnless staminate spikelet, short and rather sparse; awn of the fertile flower long and bent.

Grows in dry, sterile soils, and flowers in August and September.

This species has not been cultivated in this State, but Dr. Vasey states that it is abundant on the prairies of the West, where it is one of the principal hay grasses of the country, and is extensively cut and cured for winter use. An analysis of specimens from Pennsylvania, gave ash 13.53, fat 2.47, nitrogen-free extract 51.97, crude fiber 27.04, albuminoids 4.99.

81. *ANDROPOGON SCOPARIUS*, Michaux.*An-dro-po'-gon sco-pa'-ri-us.*

PLATE XLII.

Common Names. Wood Grass, Purple Wood Grass, Broom Grass.

Perennial. Stems from three to four feet high, with numerous paniculate branches; lower sheaths and narrow leaves hairy. Spikes slender, scattered, mostly pedunculate, from one to two inches long, very loose, often purplish, sickly, with dull whitish hairs. Sterile spikelet awn-pointed or awnless, the fertile flower about half the length of its twisted or bent awn.

Grows in dry, barren soils, and flowers in August.

In some parts of the South it is very common and much despised, though it has its good qualities, for in the dry pine woods it contributes, while green and tender, a large share to the sustenance of stock.

One analysis made in Washington, of specimens from Alabama, gave ash 5.84, fat 1.58, nitrogen-free extract, 62.29, crude fiber 24.64, albuminoids 5.65.

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	no.		no.
Agropyrum caninum,	51	Glyceria acutiflora,	34
“ repens,	50	“ aquatica,	32
+ Agrostis alba,	10	+ “ Canadensis,	27
“ canina,	9	“ elongata,	29
“ perennans,	7	“ fluitans,	33
“ scabra,	8	“ maritima,	35
+ “ vulgaris,	10	+ “ nervata,	30
Alopecurus geniculatus,	3	“ obtusa,	28
+ “ pratensis,	2	“ pallida,	31
Ammophila arundinacea,	17	Grapphepophorum melicoides,	25
Andropogon furcatus,	80	Hierochloa alpina,	64
+ “ scoparius,	81	“ borealis,	63
+ Anthoxanthum odoratum,	65	+ Holcus lanatus,	62
+ Asprella hystrix,	56	+ Hordeum jubatum,	52
Avena striata,	58	+ Leersia oryzoides,	1
+ Brachyelytrum aristatum,	15	Lolium perenne,	49
Bromus asper,	47	Muhlenbergia glomerata,	12
+ “ ciliatus,	46	“ Mexicana,	13
“ secalinus,	45	“ sylvatica,	14
Cinna arundinacea,	11	+ Oryzopsis asperifolia,	18
+ Cynodon dactylon,	24	“ Canadensis,	19
+ Dactylis glomerata,	26	+ Panicum capillare,	69
+ Danthonia spicata,	57	“ clandestinum,	72
Deschampsia cespitosa,	61	+ “ crusgalli,	76
+ “ flexuosa,	60	“ depauperatum,	75
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“ mollis,	55	“ virgatum,	70
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+ Festuca elatior,	44	+ Phalaris arundinacea,	67
+ “ ovina,	43	+ “ Canariensis,	66
“ tenella,	42	+ Phleum pratense,	4

	no.		no.
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+ <i>Poa annua</i> ,	37	+ <i>Spartina cynosuroides</i> ,	21
+ " <i>compressa</i> ,	38	+ " <i>juncea</i> ,	22
" <i>laxa</i> ,	39	" <i>stricta</i> ,	23
" <i>pratensis</i> ,	41	<i>Sporobolus cuspidatus</i> ,	5
" <i>serotina</i> ,	40	" <i>serotinus</i> ,	6
+ <i>Setaria glauca</i> ,	77	<i>Stipa Richardsonii</i> ,	20
" <i>Italica</i> ,	79	<i>Trisetum subspicatum</i> ,	59

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Bent Grass,	10	False Red Top,	40
Bermuda Grass,	24	False Rice,	1
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Blue Joint-Grass,	16	Meadow Grass,	39
Blue Stem,	80	Few-Flowered Panic Grass,	75
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Canadian Rice,	19	Foxtail,	77
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	NO.		NO.
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	NO.		NO.
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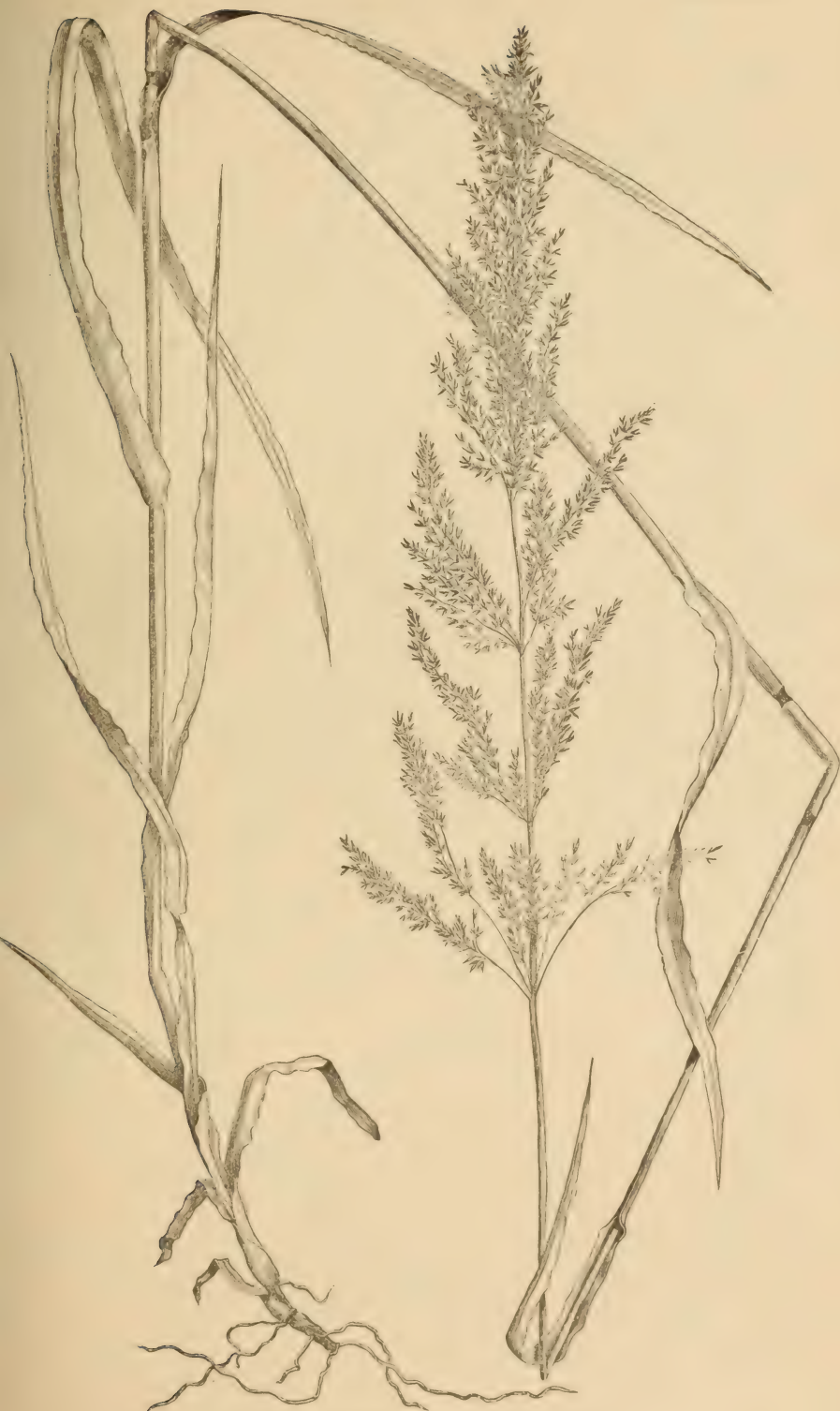
PHLEUM PRATENSE, L. (*Timothy*).

Moore





AGROSTIS CANINA, L. (*Brown Bent-Grass*).



AGROSTIS VULGARIS, With. (*Red-Top*).

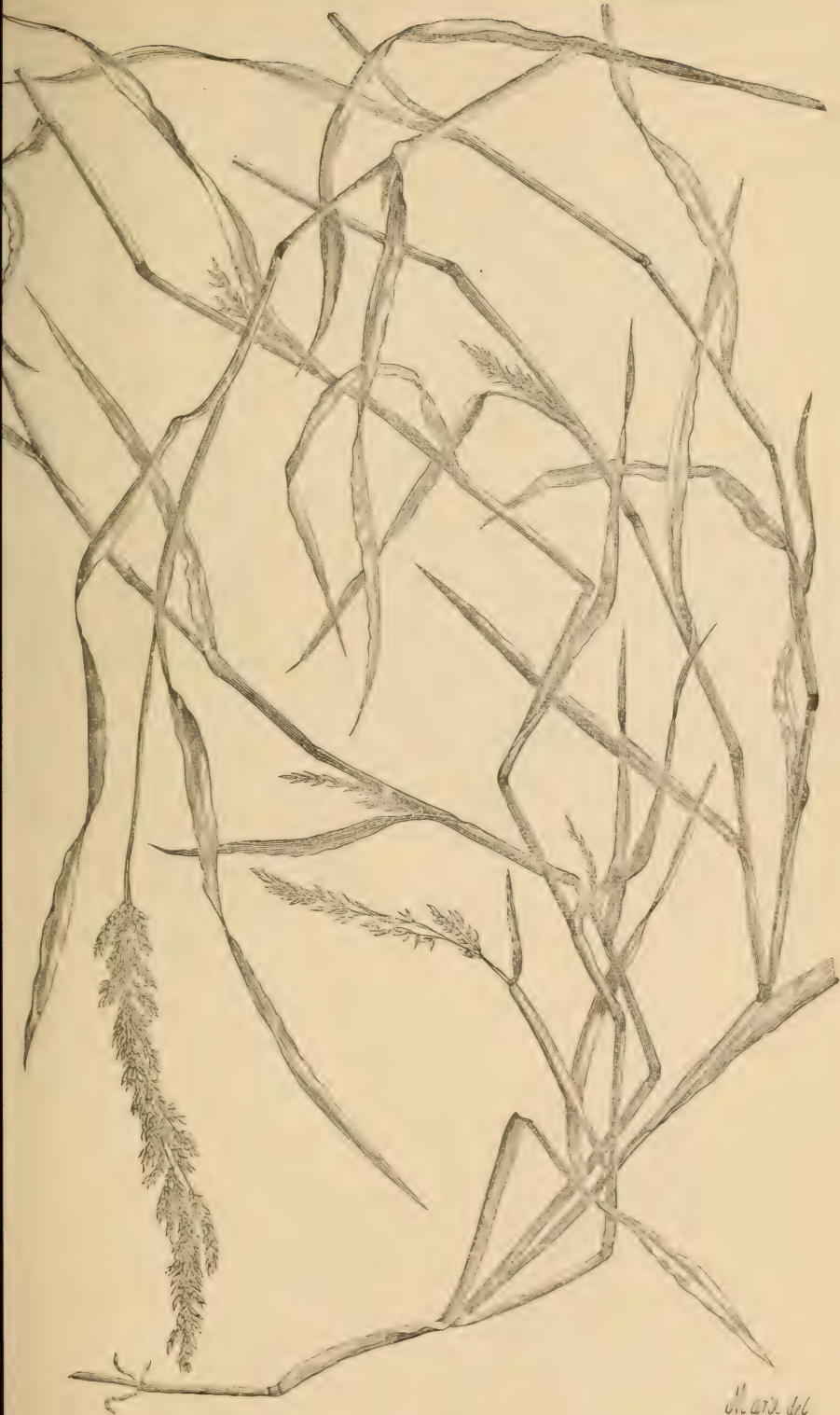


CINNA ARUNDINACEA, L. (*Wood Reed-Grass*).



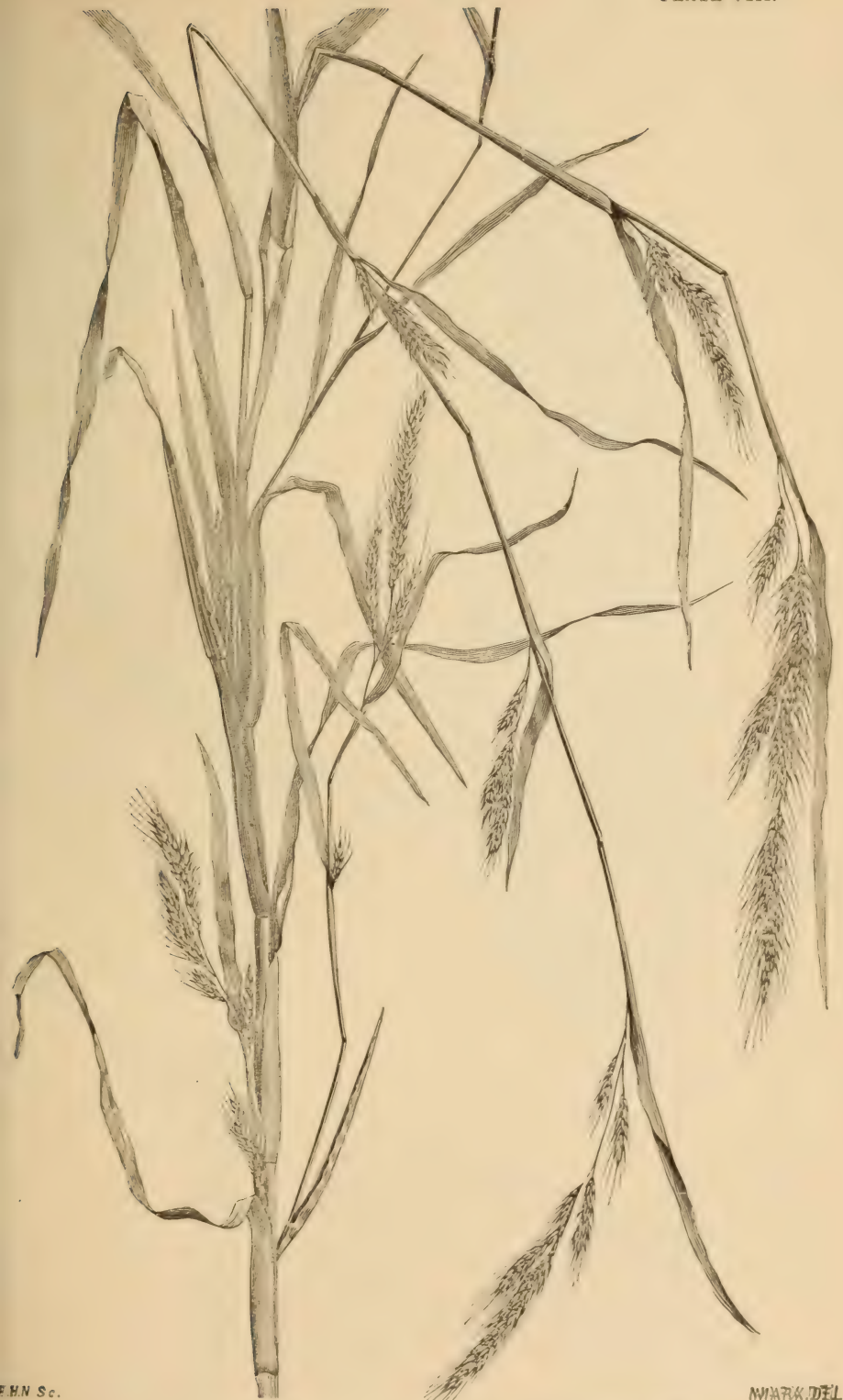
WARX.DEL.

MUHLENBERGIA GLOMERATA, Trin. (*Spiked Muhlenbergia*).



MUHLENBERGIA MEXICANA, Trin. (Wood Grass).

M. A. del

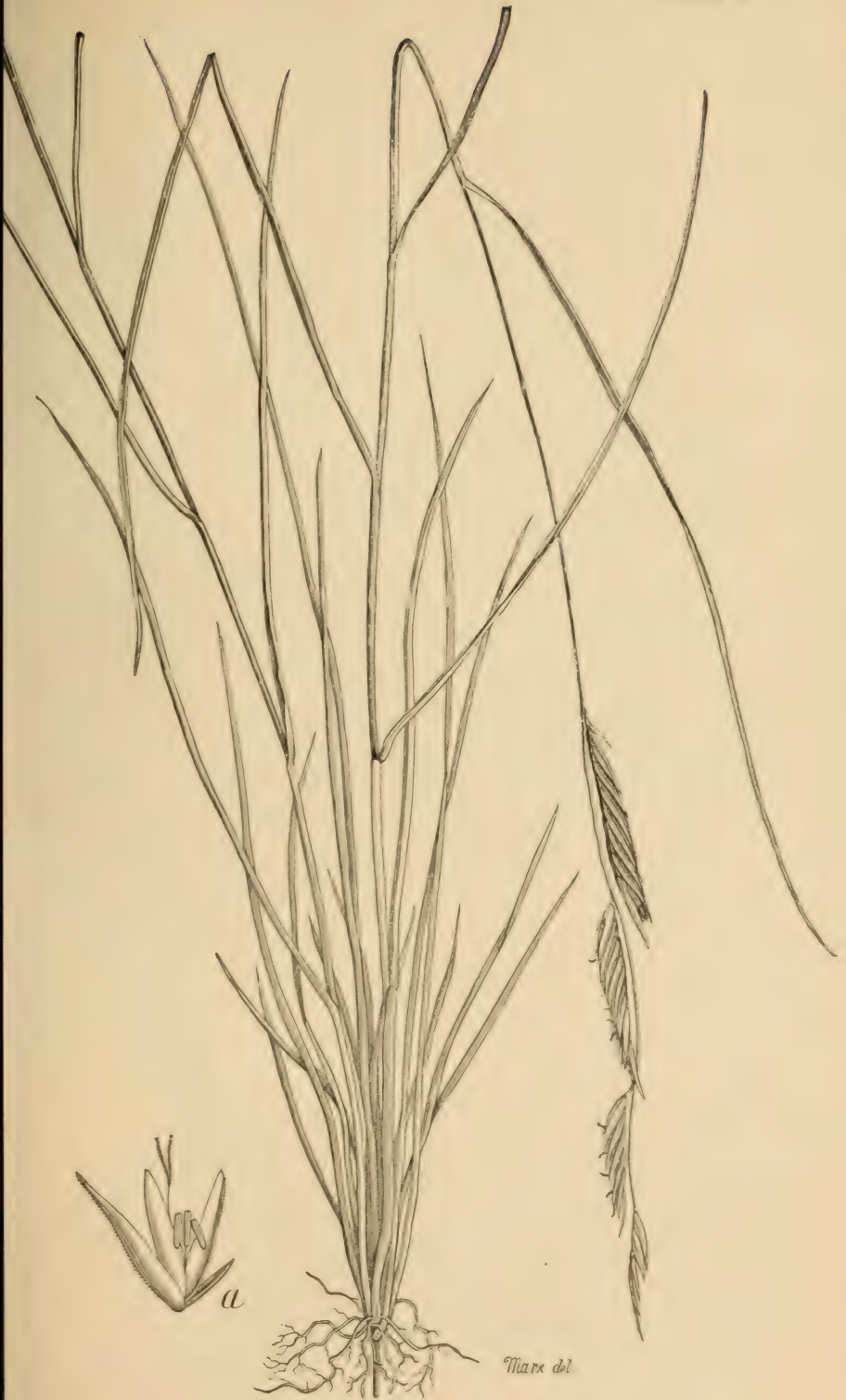




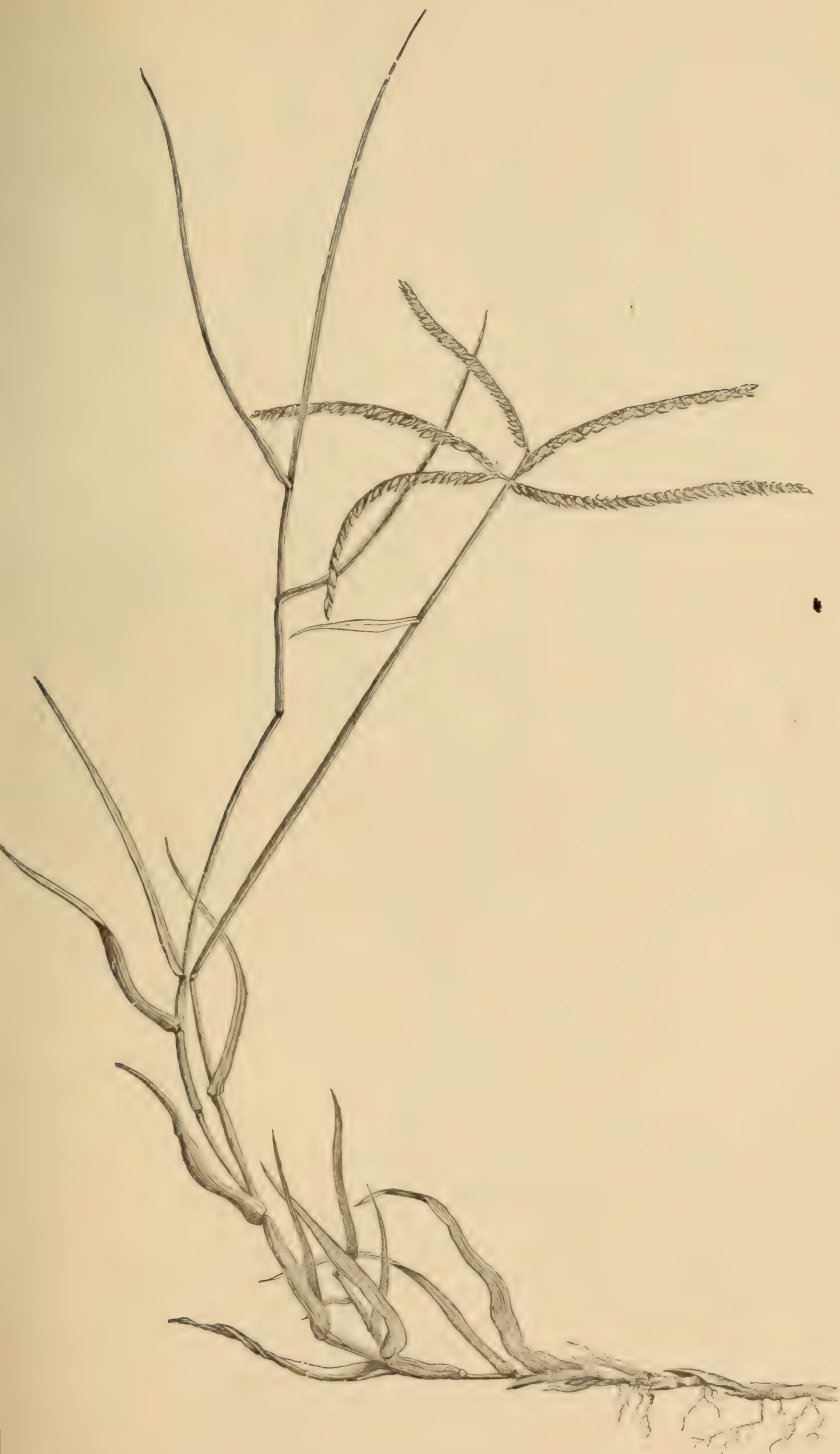
NICHOLS-ENG.

MARX-DEL.

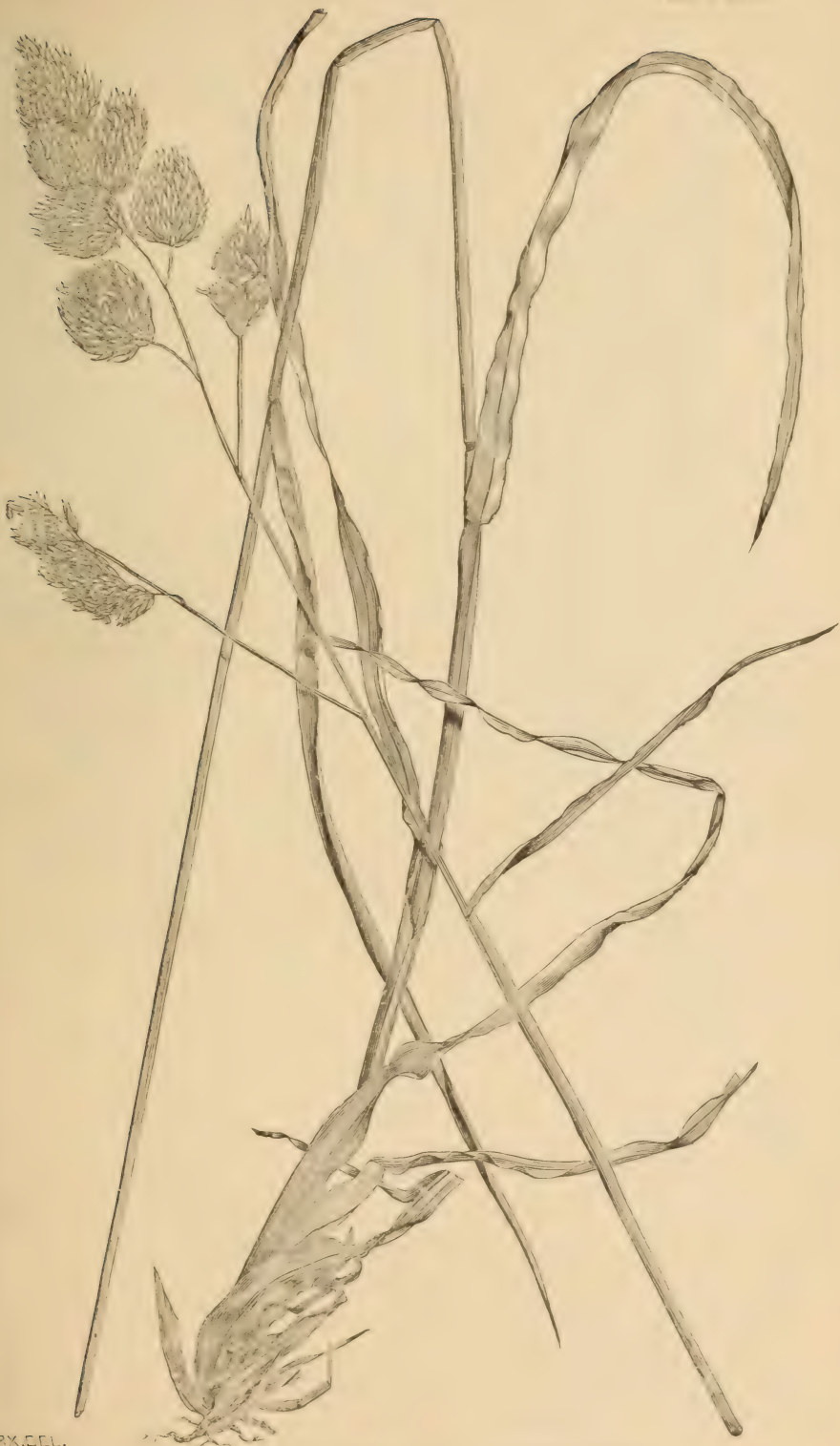
LEYMUS CANADENSIS, Beauv. (*Blue Joint-Grass*).



SPARTINA JUNCEA, Willd. (*Rush Salt-Grass*).



CYNODON DACTYLON, Pers. (*Bermuda Grass*).



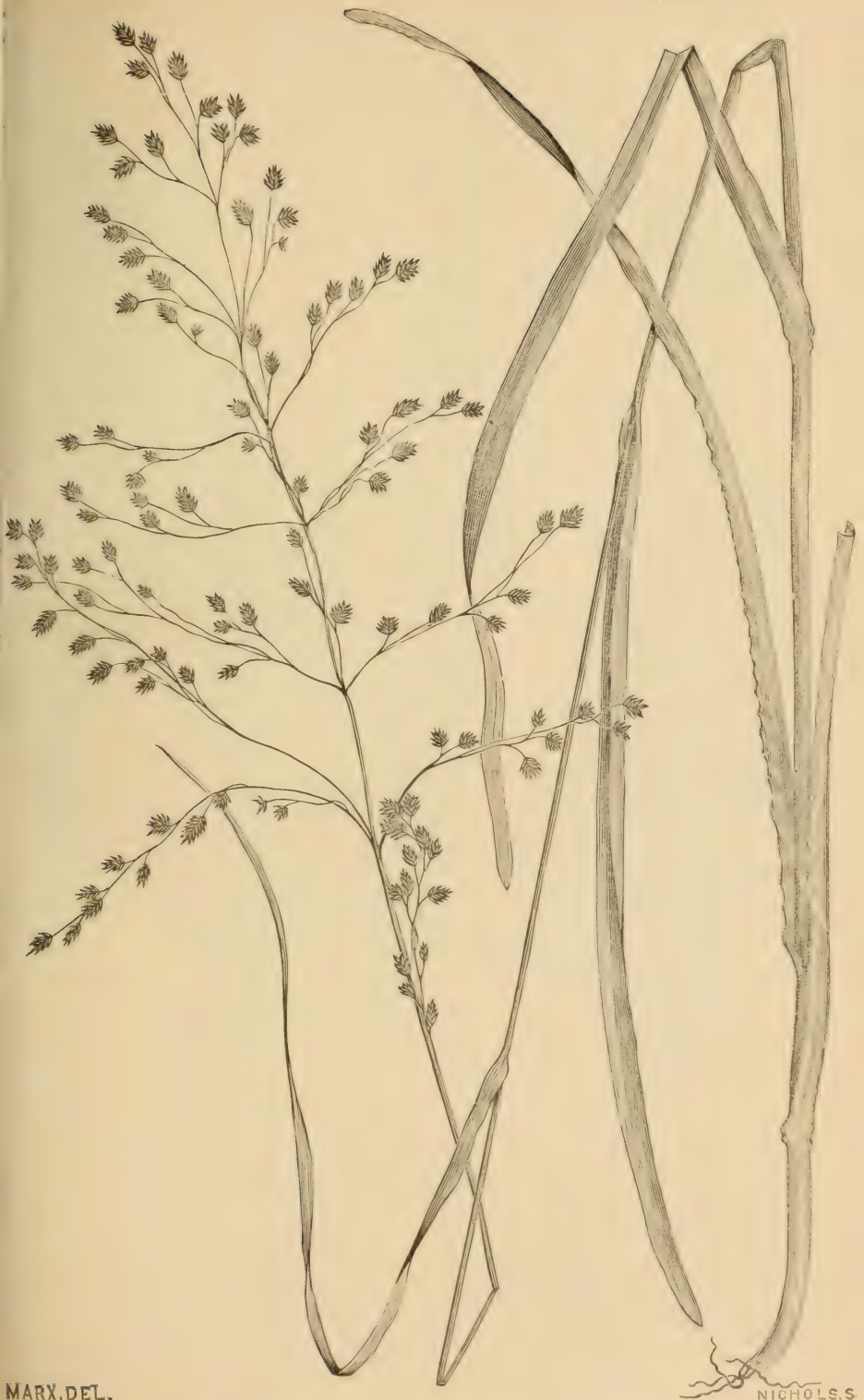
FRX. DEL.

DACTYLIS GLOMERATA, L. (*Orchard Grass*).



MARX

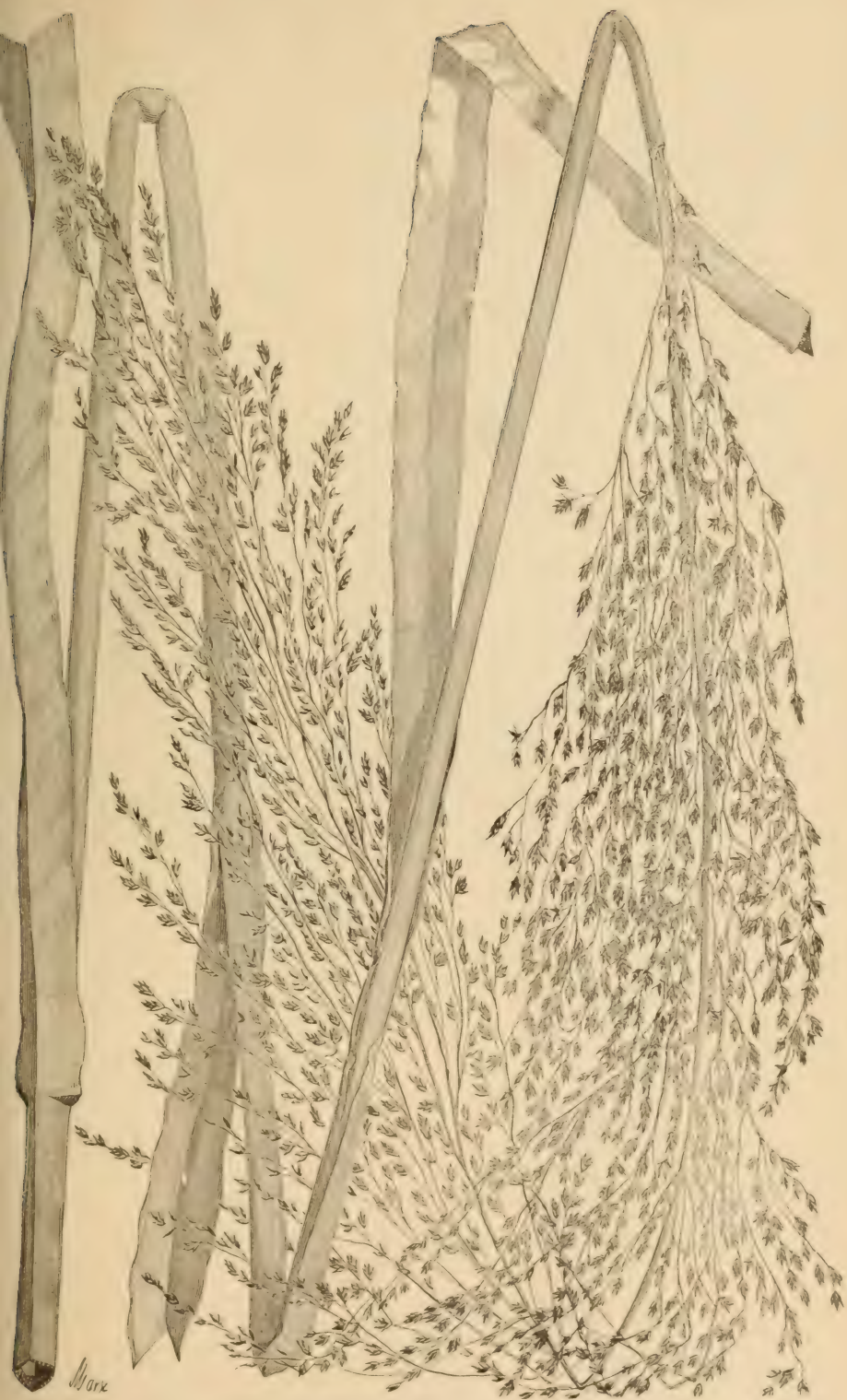
GLYCERIA CANADENSIS, Trin. (*Rattlesnake Grass*).



MARX.DEL.

GLYCERIA NERVATA, Trin. (*Nerved Meadow-Grass*).

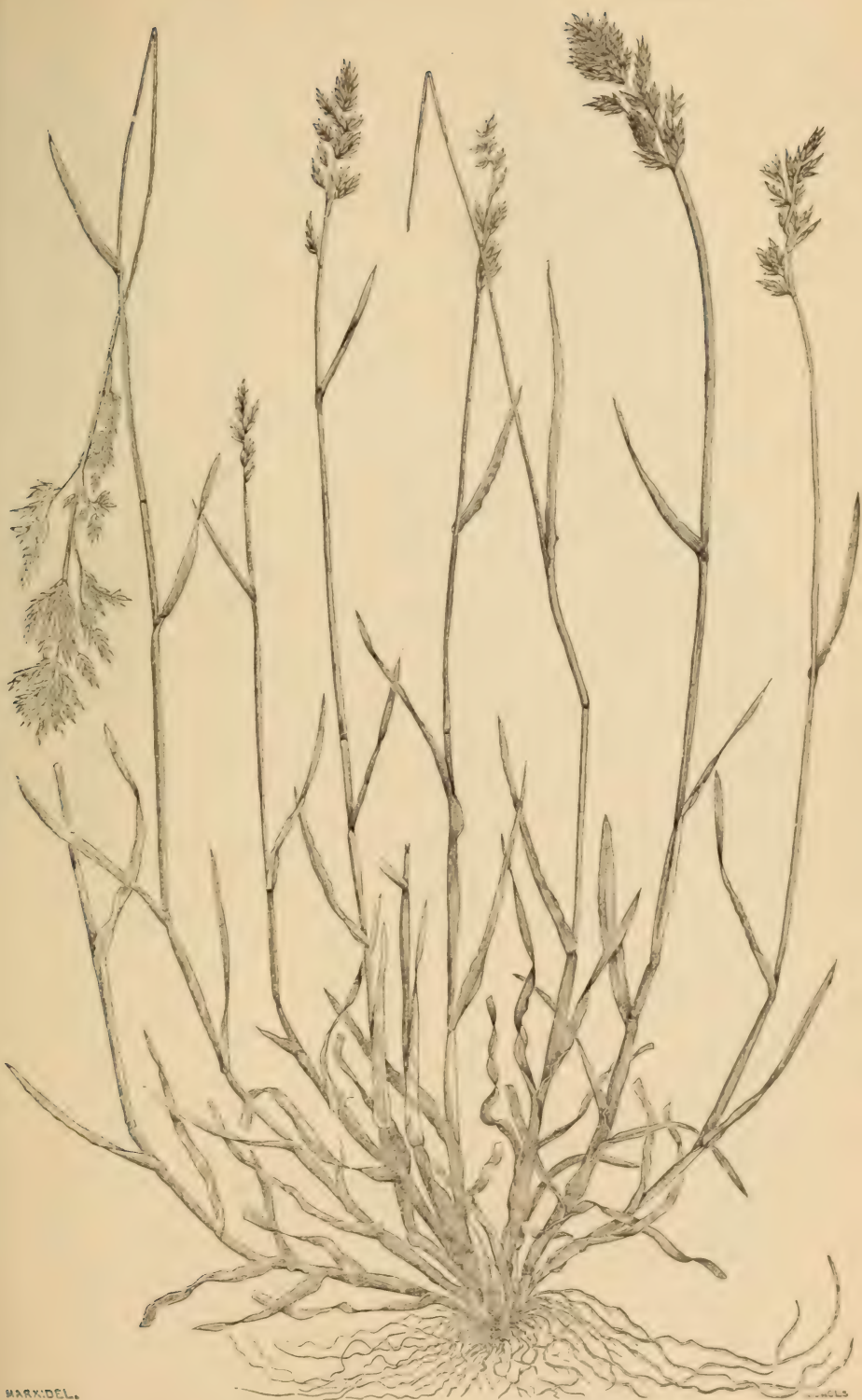
NICHOLS.S



GLYCERIA AQUATICA, Smith. (Reed Meadow-Grass).

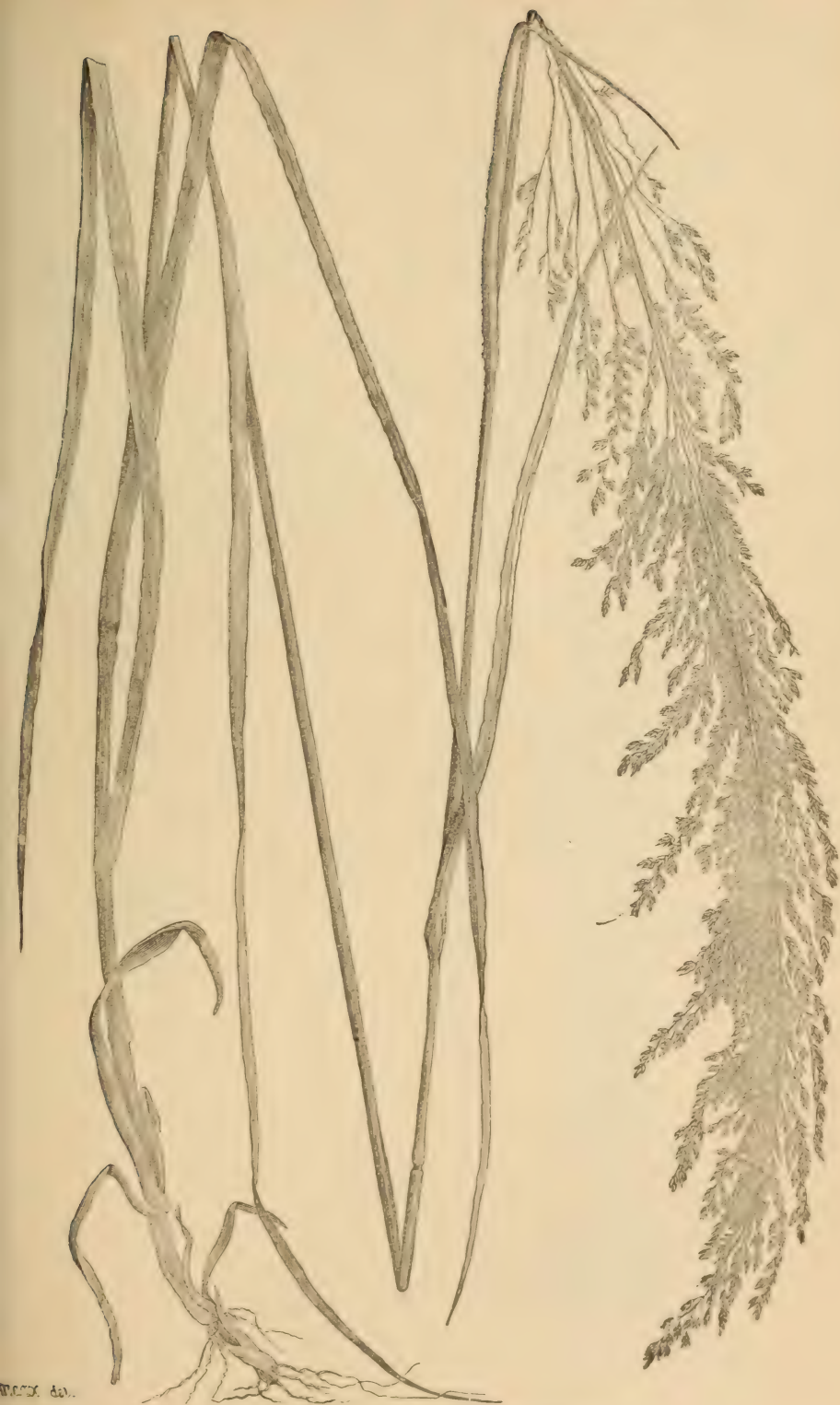


DISTICHLIS MARITIMA, Raf. (*Spike Grass*).



MARK DEL.

POA COMPRESSA, L. (Wire Grass.)



W. & A. D.

POA SEROTINA, Ehr. (*Fowl Meadow-Grass*).



Marx del.

POA PRATENSIS, L. (*Kentucky Blue-Grass*).



WARR.DEL.

W.H.HOLLS.ENG.

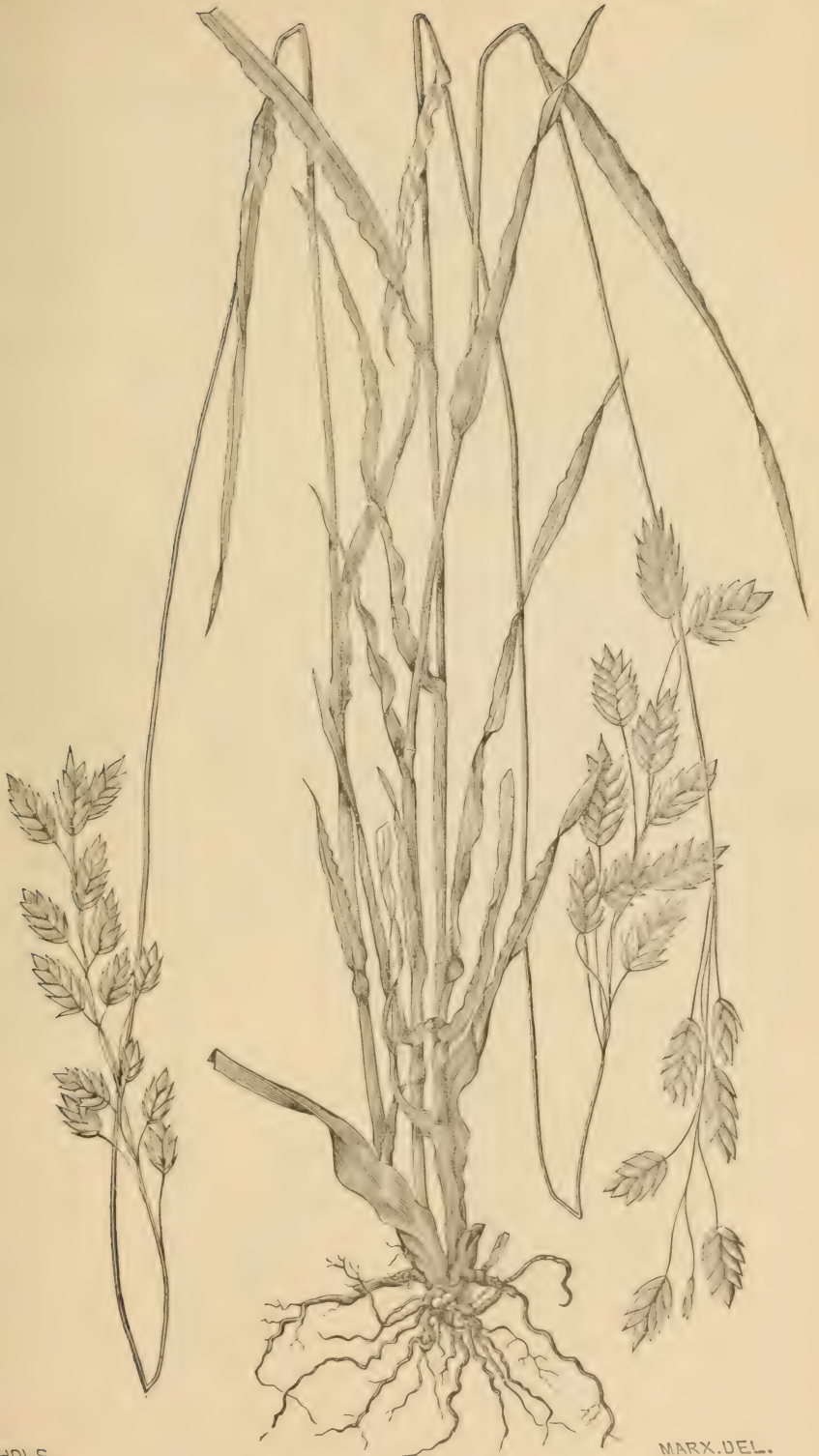
FESTUCA OVINA, L. (*Sheep's Fescue*).



MARX.DEL.

NICHOLS

FESTUCA ELATIOR, L. (*Meadow Fescue*).



H.H.NICHOLS.

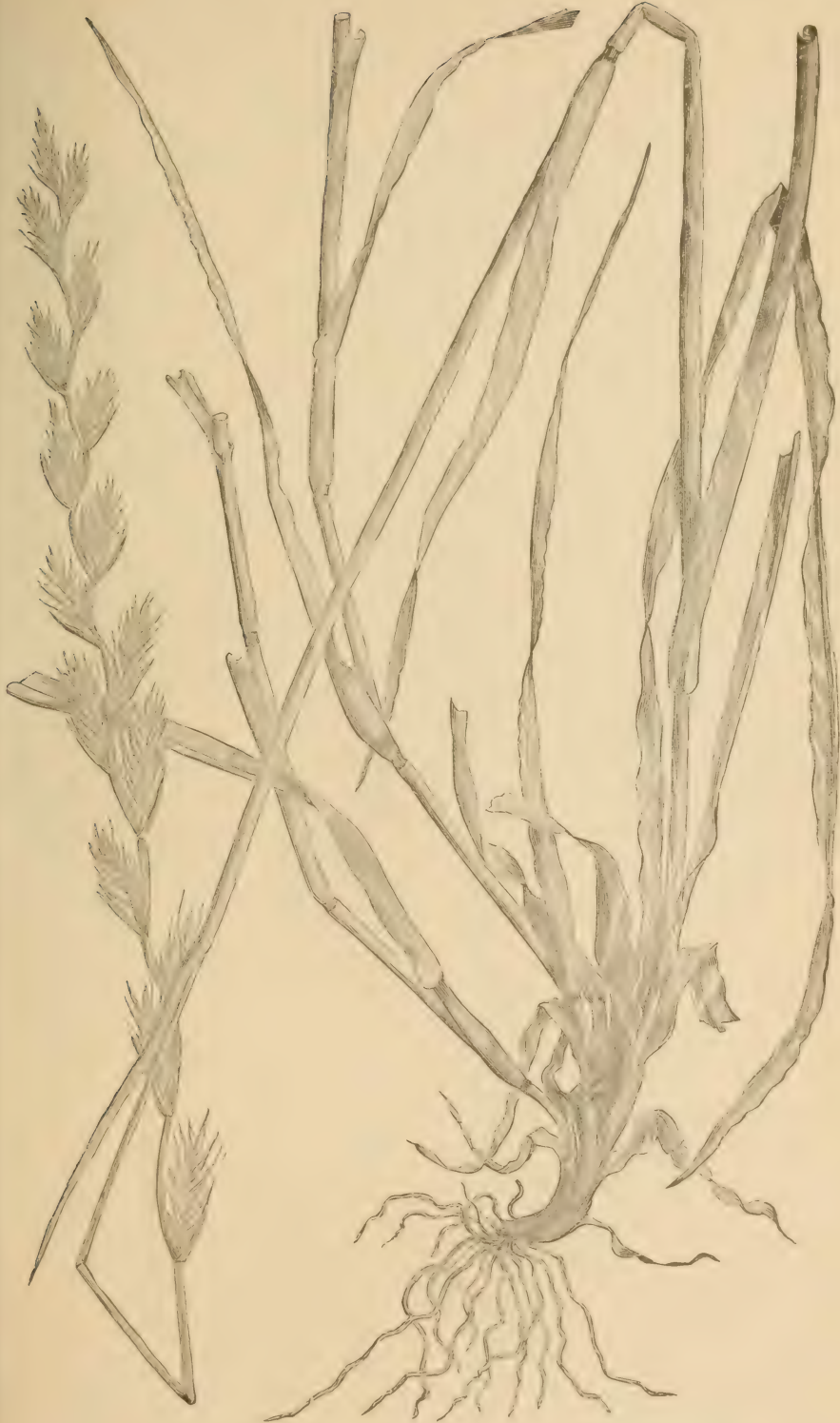
MARX.DEL.

BROMUS SECALINUS, L. (*Cheat or Chess.*)



PHRAGMITES COMMUNIS, Trin. (Reed).

MARY del.



LOLIUM PERENNE, L. (*Rye-Grass*).



MARX.DEL.

AGROPYRUM REPENS, L. (Witch-Grass).



ELYMUS VIRGINICUS, L. (*Smooth Rye-Grass*).

MARX. DEL.



ELYMUS CANADENSIS, L. (*Wild Rye*).



DANTHONIA SPICATA, Beauv. (Wild Oat-Grass).

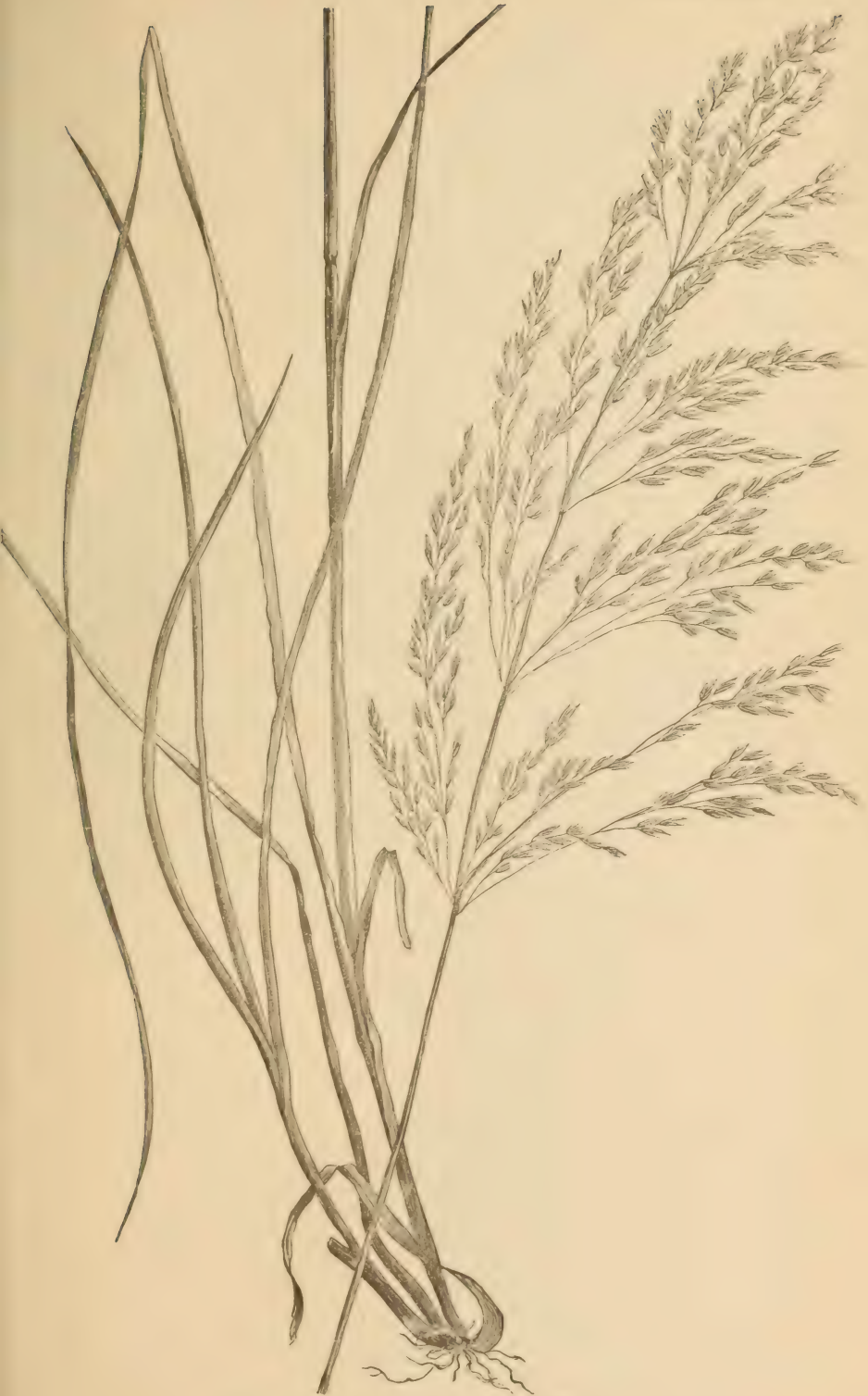


AVENA STRIATA, Michx. (*Wild Oat-Grass*).

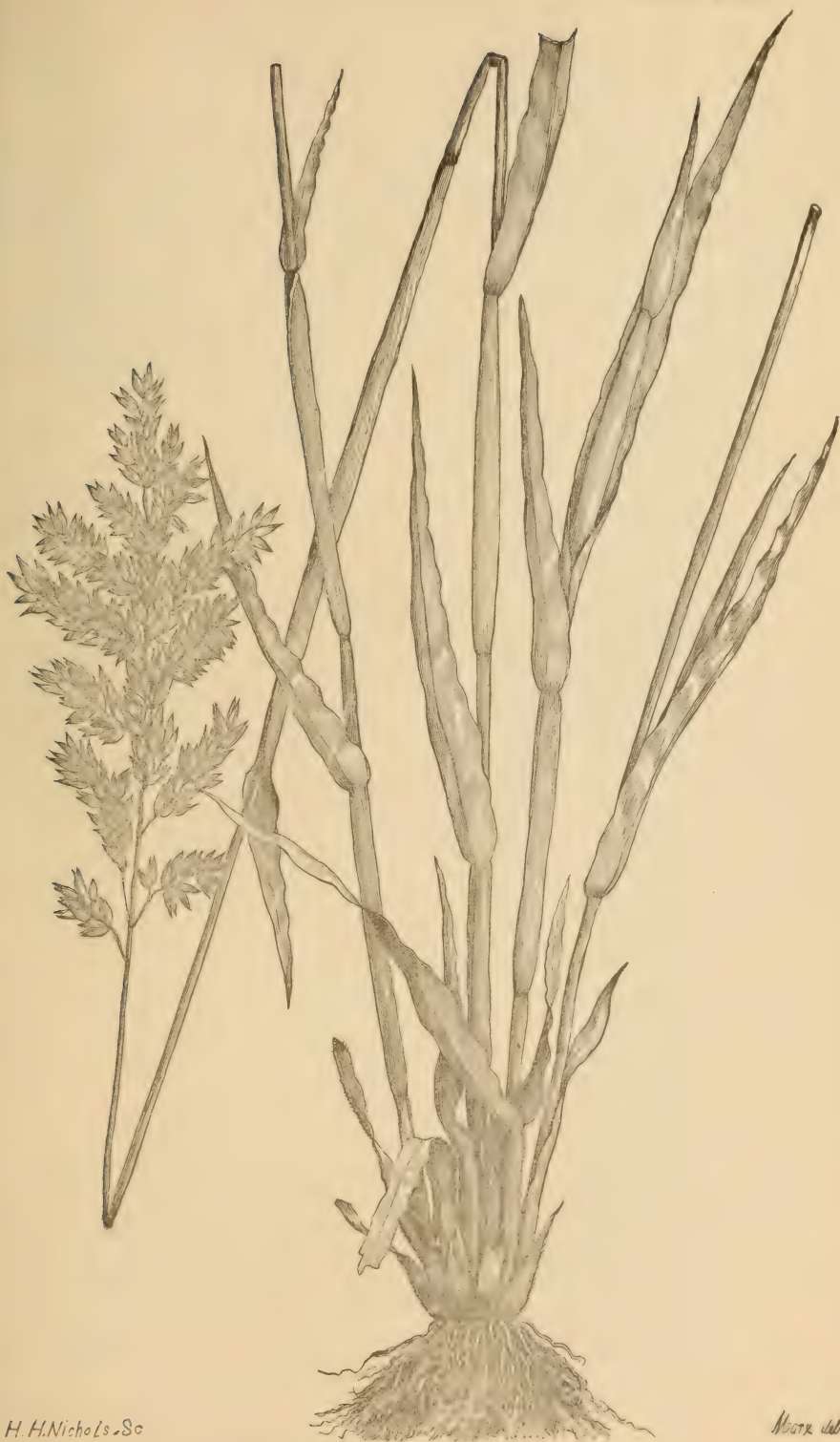


H.H. NICHOLS.

TRisetum subspicatum. Beauv.



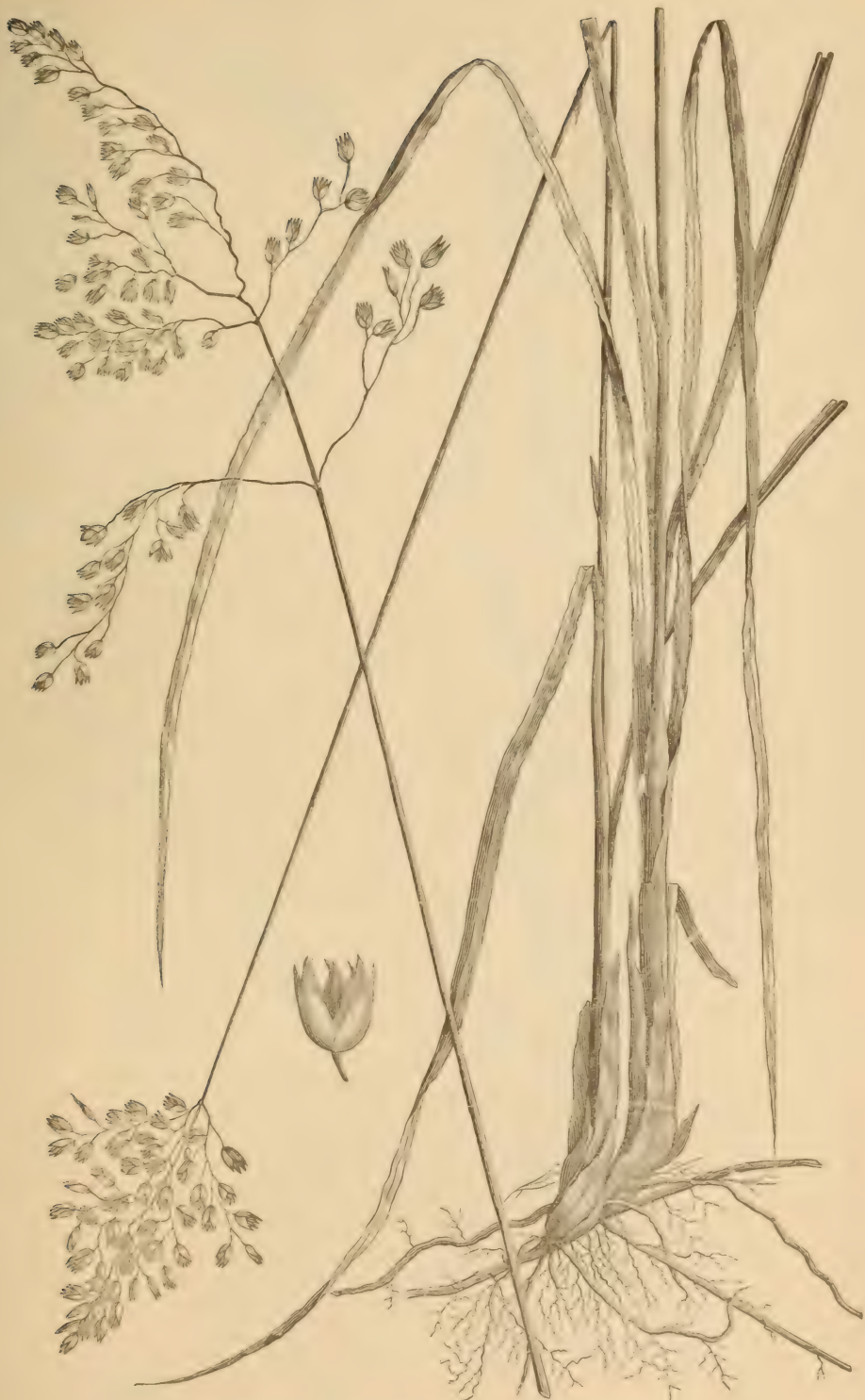
DESCHAMPSIA CAESPITOSA, L. (*Hair Grass*).



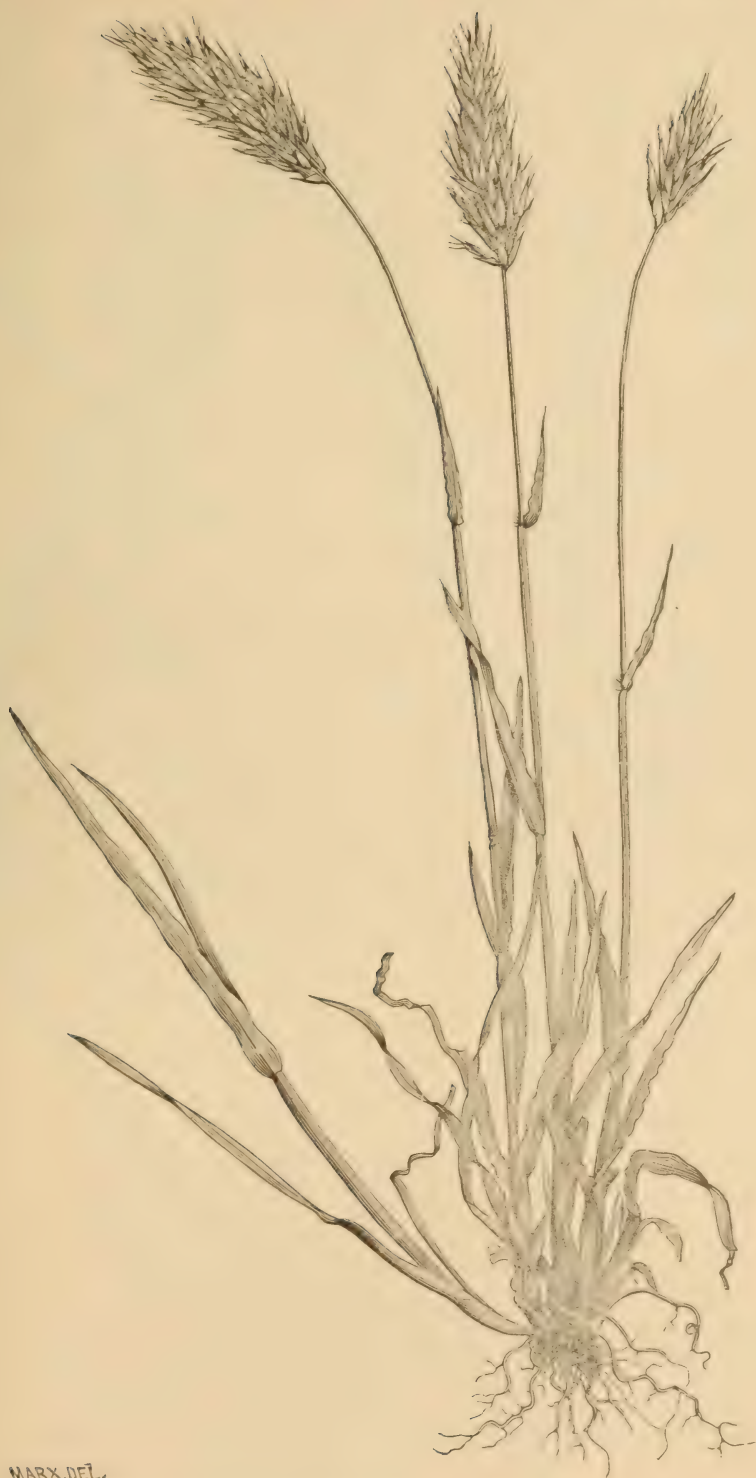
H. H. Nichols Sc

Morse del.

HOLCUS LANATUS, L. (Velvet Grass).



HIEROCHLOA BOREALIS, R & S. (*Vanilla Grass*).



WARX.DEL.

ANTHOXANTHUM ODORATUM, L. (*Sweet Vernal-Grass*).



O. HEIDEMANN SC.

Marx del.

PHALARIS ARUNDINACEA, L. (*Reed Canary-Grass*).



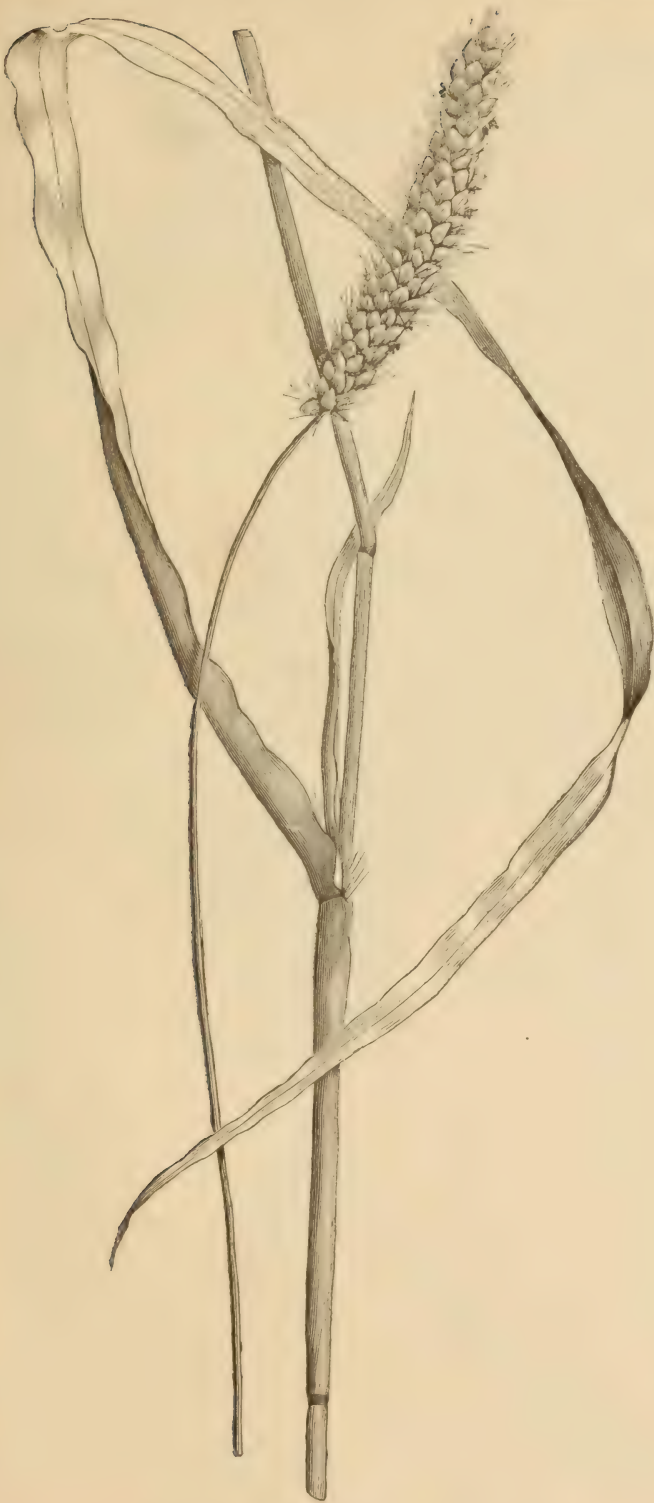
PANICUM CAPILLARE, L. (*Old-Witch Grass*).



PANICUM VIRGATUM, L. (*Tall Panic-Grass*).



PANICUM CRUS-GALLI, L. (*Barnyard Grass*).



SETARIA GLAUCA, Beauv. (*Foxtail*).



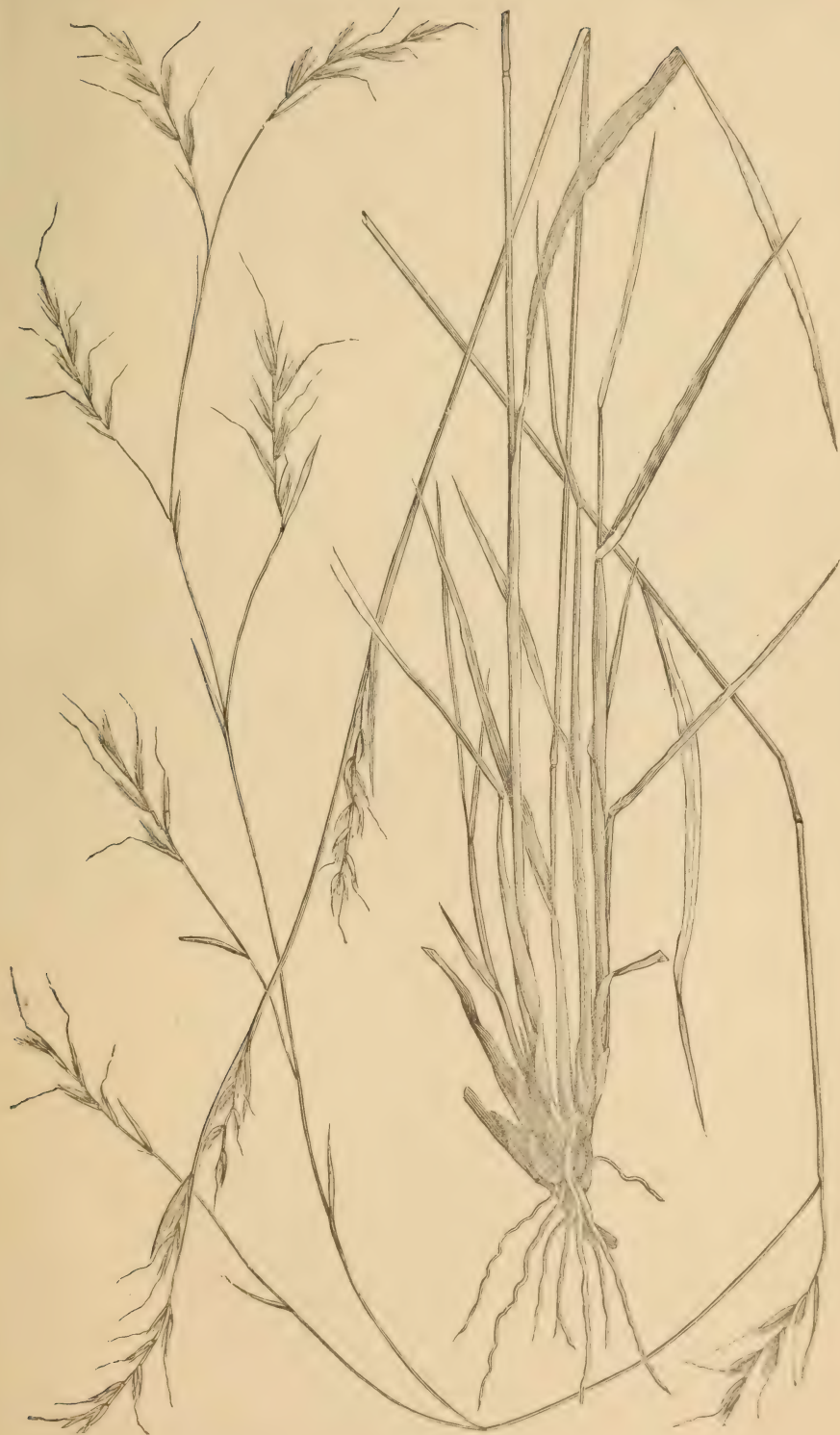
SETARIA ITALICA, Kunth. (*Hungarian Grass*).

Max del



W. L. C. del.

ANDROPOGON FURCATUS, Muhl. (*Blue Stem*).

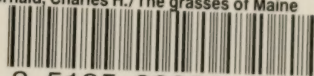


ANDROPOGON SCOPARIUS, Michx. (*Wood Grass*).



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